35

JAN 29 1949

Bulletin of the

Atomic Scientists

JANUARY 1949 35c

J. ROBERT OPPENHEIMER: The Open Mind

DAVID LILIENTHAL
Private Industry and the Public Atom

FRANÇOIS DE ROSE
The Atomic Energy Debate at Paris

OUGHT SCIENCE TO BE PLANNED?
J. D. Bernal and Michael Polanyi

THE SOCIALIST ISLAND
James R. Newman and Byron S. Miller
Reply by A. P. Lerner

NATIONAL SCIENCE FOUNDATION
Articles by
Howard Meyerhoff, Reuben Frodin,
Washington Association
of Scientists

Vol. 5 Chicago, Illinois No. 1

Just How Important Is

THE ATOMIC BOMB?

IN these times of mounting tensions, the atomic scientists continue—as they have since the bomb fell on Hiroshima—to tell all who will listen of the social and political implications of their discoveries. Their message is increasingly important: "The responsibility to see that atomic energy is used for the benefit and not the destruction of mankind is ours—and YOURS."

THE scientists do not claim to have all the answers but they are continually exploring the relationship between science and society, between the potentialities of atomic warfare and the survival of civilization. The monthly BULLETIN OF THE ATOMIC SCIENTISTS is their medium for keeping abreast of developments in this field. It should be yours, too, if you are to participate intelligently in the democratic decisions on which our destiny may hinge.

JUST how important is the atomic bomb? The term "atomic age" seems to have drifted into our vocabulary. Its implications are too often absent from our thinking. Recent issues of the BULLETIN OF THE ATOMIC SCIENTISTS show how the problems created by atomic energy impinge on every phase of our existence.

WARFARE. In an authoritative article, "How Dangerous Are Atomic Weapons?", Edward Teller discussed the probabilities of newer, more powerful bombs, capable of producing a radioactive cloud that could endanger a continent. Austin Brues' report of his observations with the Atomic Bomb Casualty Commission described the effects of atomic bomb injuries and revealed a previously untold story of the Japanese decision to surrender. "Atomic Bomb Explosions—Effects on an American City" by R. E. Lapp outlined the probable effects of an atomic attack on a city and examined some aspects of atomic defense.

POLITICS. A workable system for the prevention of warfare and the control of atomic energy is the only answer to the political problem posed by the atomic bomb. The BULLETIN has carried articles by R. Gordon Arneson, Quincy Wright, Warren R. Austin, Leo Szilard, Abba P. Lerner, Edward A. Shils, Cuthbert Daniel and Arthur M. Squires, Harold C. Urey, Philip Morrison and Robert R. Wilson, David E. Lilienthal, J. Robert Oppenheimer, and others, all dealing with phases of this problem. In addition, the BULLETIN carries a monthly review of United Nations developments in the field of atomic energy by Peter Kihss, New York Herald Tribune staff member and a notably astute observer of UN activities. The BULLETIN has also printed the texts or careful condensations of major documents issued by the UN and the United States Atomic Energy Commissions.

ECONOMICS. BULLETIN readers are kept informed on economic aspects of atomic energy by articles such as the authoritative report on the costs of atomic power and the economic factors which may affect its use by Sam H. Schurr, co-director of the study of Economic Aspects of Atomic Energy conducted by the Cowles Commission at the University of Chicago.

SCIENCE. Although the BULLETIN is not a technical journal, its articles on the developments in science which importantly affect our civilization have attracted wide interest and comment. Articles by H. J. Muller, Kenneth V. Thiman, Edward Teller, J. Robert Oppenheimer, Milton Burton and others have covered the field from the effects of radiation on the genes and heredity, to proposals for reorganization of research.

All these articles, and many more, dealt with problems of vital concern to you. If you missed them, you owe it to yourself as an intelligent citizen, to see that you do not miss future issues, as the BULLETIN continues its coverage of the most important problem the human race has faced since the discovery of fire.

WM.

Bulletin of The Atomic Scientists

1126 East 59th Street, Chicago 37, Ill.

Subscribe

Please enter my subscription to the BULLETIN for 1 year at $3.50.
My check or money order is enclosed.

Name.....

Street Address .....

City ..... Zone..... State.....

☐ Please send me information about special rates for group subscriptions for schools, colleges and educational organizations to be sent to one address.

Now!

Published monthly by the Atomic Scientists of Chicago, 1126 East 59th Street, Chicago 37. Phone: Midway 3-3056.

The opinions expressed in the BULLETIN do not represent the official views of any organization. Subscription price—$3.50 a year. Single copy—35 cents. Four weeks notice is required for change of address, both old and new addresses must be given. Manuscripts should be sent in triplicate to H. H. Goldsmith at the above address.

Bulletin of the Atomic Scientists

Volume 5 Number 1

Editors
H. H. Goldsmith
Eugene Rabinowitch

Assistant Editors
Ruth Shils, Mary M. Simpson

Editorial Assistant
Joan Bernick

Editorial Board
Kenneth S. Cole, T. H. Davies, H. H. Goldsmith, Samuel Goudsmit, Clyde A. Hutchison, Jr., Eugene Rabinowitch, Edward A. Shils, John Simpson

Board of Sponsors
J. Robert Oppenheimer, Chairman
Harold C. Urey, Vice-Chairman
H. A. Bethe, Detlev W. Bronk, A. H. Compton, E. U. Condon, Farrington Daniels, L. A. DuBridge, Albert Einstein, James Franck, S. A. Goudsmit, T. R. Hogness, F. W. Loomis, Philip M. Morse, H. J. Muller, Linus Pauling, G. B. Pegram, I. I. Rabi, Julian Schwinger, Cyril S. Smith, Leo Szilard, Edward Teller, V. F. Weisskopf, Sewall Wright, J. R. Zarcharias.

In This Issue

National Science Foundation, 1949.... 2
by Howard A. Meyerhoff

The Open Mind 3
by J. Robert Oppenheimer

Private Industry and the Public Atom 6
by David Lilienthal

The Atomic Energy Debate at Paris.... 9
by Francois de Rose

Can Atomic Weapons Keep the Peace? 11
by N. F. Mott

The Socialist Island 13
by James R. Newman and Byron S. Miller

Does Control of Atomic Energy Involve a Controlled Economy? 15
by A. P. Lerner

Ought Science to be Planned?.....17
by J. D. Bernal and Michael Polanyi

National Science Foundation Proposals: Background and Commentary.....21
by Reuben Frodin

Uncertain Prospect: National Science Foundation 25
Washington Association of Scientists

Scientsts' Responsibilities 27
by Cuthbert Daniel and Arthur M. Squires

United Nations Atomic Energy News..29
by Peter Kihss

Announcing . . .

The first publication in this country of Professor Blackett's brilliant, controversial book . . .

FEAR, WAR, AND THE BOMB

By P. M. S. Blackett
1948 Nobel Prize Winner in Physics

● **Coming on February 14th**
Reserve your copy now ●

When this book was first published in Great Britain, it aroused an immediate and violent storm of controversy. Professor Blackett, a former member of Great Britain's Advisory Committee on Atomic Energy, holds a position sharply at variance with that of the British and American governments. His startling dissent on the atomic bomb and its control has aroused world-wide attention.

James P. Warburg, former deputy director, United States Office of War Information calls FEAR, WAR, AND THE BOMB, "Brave heresy and astounding orthodoxy—keen insight, originality and willingness to question the accepted axioms of our time . . . the work may well become a milestone in post-Hiroshima thinking."

One of the world's most distinguished physicists, Professor P. M. S. Blackett crowned a notable career in nuclear research by being selected by the Nobel Committee for its 1948 award for physics. At Manchester University, Professor Blackett has built up what is probably the largest school of cosmic ray research in Europe.

How you can make sure of reserving a copy of this important book on publication date

FEAR, WAR, AND THE BOMB will be published on February 14th. In order to insure your getting a copy of this book immediately upon publication, reserve it now at your bookstore, or fill in and mail this coupon today. $3.00.

EXAMINE THIS BOOK 10 DAYS FREE

WHITTLESEY HOUSE
McGRAW-HILL BOOK CO., Inc., 330 W. 42nd St., N.Y. 18

Please send me Blackett's FEAR, WAR, AND THE BOMB for 10 days' examination on approval. In 10 days I will remit $3.00, plus a few cents postage, or return the book postpaid. *

Name .....
Address.....
City ..... Zone..... State.....
Company .....
Position .....

*SAVE! We pay mailing costs if you send cash with this coupon. Same return privilege.

NATIONAL SCIENCE FOUNDATION, 1949

Howard A. Meyerhoff

The opening of the 81st Congress provides a fresh opportunity for scientists to present the case for the establishment of a National Science Foundation. Four opinions on legislation for science are published in this issue of the **Bulletin.** Two British scientists debate the desirability of planning scientific research on page 17; a University of Chicago lawyer gives a summary of previous NSF legislation on page 21; and on page 25, a committee of the Washington Association of Scientists describes the kind of legislation it would like to see enacted. In the following article, Dr. Howard A. Meyerhoff, Administrative Secretary of the American Association for the Advancement of Science, summons scientists to a concerted campaign for a well-conceived Foundation.

Scientists have shown a phenomenal capacity to harness and control everything except the weather and fellow human beings, and some progress can be reported on the weather. They have been so concerned with conquests of natural forces that they have permitted nonprofessional groups to use their discoveries, to guide their destinies, and even to thwart their interests. Clearly, scientists are not class-conscious. Whether it be the result of professional ethics, intellectual detachment, naive innocence, or some combination thereof, they have certainly let themselves be pushed around.

Organized Labor, claiming credit for the outcome of the November elections, proposes frankly and openly to cash in on the victory by demanding a greater share of the fruits of applied science.

Organized Industry, claiming credit for the production miracles which won the war and made this country the economic bulwark of a battered world, formally and publicly opposed the first National Science Foundation bill (S. 1850, 79th Congress) on the basis of patent issues which might deprive industry of profits from patentable discoveries.

The Military, taking credit for the victory over formidable enemies, refused to exempt scientists from non-scientific military service during the war, or even to defer them or release them from service except as—and only so long as—industrial and essential research organizations could establish the indispensability of individual men.

It is not presumptuous to restate the fact that Labor, Industry, and the Military would have little for which they might claim credit were it not for the men and women responsible for discoveries in science and for the engineering applications of science. These people have sought neither credit nor favored status; yet, for the welfare of the nation, they need favorable working conditions and security to an even greater degree than Labor.

The terms "favorable working conditions" and "security" have somewhat different meanings than they do in labor agreements, but, as scientists define them, they are vital in promoting scientific research and in fostering creative thinking. They are only in part concerned with the comfort and economic status of the individual worker. They involve, instead, the mental security which results from (1) independence in the pursuit of scientific objectives; (2) housing, equipment, and assistance adequate for projects under investigation; (3) assured support to guarantee continuity and completion of research projects.

At the present time these conditions and this type of security are seldom encountered. The several government agencies which sponsor research have been created to achieve results in restricted fields. They may provide ideal working conditions and security for a limited number of specialists, but they cannot meet the general need.

This statement applies especially to military agencies, however broadly they may interpret the ramifications and applications of research. They necessarily have a proprietary interest in the results of scientific endeavor, and they must—and do—exercise the right to "classify" discoveries and applications which, by classification, are removed from the healthy circulation that is indispensable to steady progress.

It is axiomatic that the rate of scientific progress is inversely proportional to the degree of secrecy which surrounds any discovery; hence the fewer the controls placed in the hands of military agencies, the more rapidly the world will get on. This is not to say or to imply that classification may not be imperative in limited fields, just as it may prove lucrative in industry. But it should be temporary, if only because scientific curiosity and ingenuity have invariably cracked every secret and have often prompted independent and simultaneous discoveries of the same basic principles.

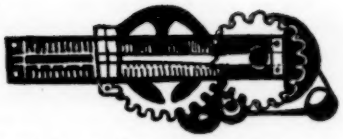
Industry, like government, is a liberal contributor to research, recognizing that its world leadership has stemmed as much from science and its applications as from shrewd management and adequate capital. But here, too, objectives are limited and directed, and the first requisite of basic research is rarely met—namely, independence.

Only our institutions of learning and a few research foundations are havens for untrammeled and disinterested scientific endeavor. Though sometimes hampered by unenlightened or prejudiced administrations, they suffer most from financial stringency. It is here that a new source of revenue is needed; it is here that we may look for greatest progress in basic, unclassified research if financial support is provided; it is here that a National Science Foundation may be expected to get results from researchers who cannot "mass-produce" or "contract-create" basic scientific discoveries.

Legislation designed to create a National Science Foundation was framed by the 79th Congress and twice by the 80th. The House of Representatives blocked passage of these bills —twice by failing to act and once by

(Continued on Page 32)

THE OPEN MIND



J. Robert Oppenheimer

Dr. Oppenheimer, Director of the Institute for Advanced Study at Princeton, was wartime director of the Los Alamos Laboratory and has been a leader in the American effort to organize international control of atomic energy. His faith in the possibility of agreement has not been shaken by the current failure of negotiations. In the following speech, given to the Rochester Institute for International Affairs, he discusses the spirit which should guide American conduct in the present impasse.

A few weeks ago the president of a college in the prairie states came to see me. Clearly, when he tried to look into the future, he did not like what he saw: the grim prospects for the maintenance of peace, for the preservation of freedom, for the flourishing and growth of the humane values of our civilization. He seemed to have in mind that it might be well for people, even in his small college, to try to take some part in turning these prospects to a happier end; but what he said came as rather a shock. He said, "I wonder if you can help me. I have a very peculiar problem. You see, out there, most of the students, and the teachers too, come from the farm. They are used to planting seed, and then waiting for it to grow, and then harvesting it. They believe in time and in nature. It is rather hard to get them to take things into their own hands." Perhaps, as much as anything, my theme tonight will have to do with enlisting time and nature in the conduct of our international affairs: in the quest for peace and a freer world. This is not meant mystically, for the nature which we must enlist is that of man; and if there is hope in it, that lies not least in man's reason. What elements are there in the conduct of foreign affairs which may be conducive to the exercise of that reason, which may provide a climate for the growth of new experience, new insight, and new understanding? How can we recognize such growth, and be sensitive to its hopeful meaning, while there is yet time, through action based on understanding, to direct the outcome?

To such difficult questions one speaks not at all, or very modestly and incompletely. If there are indeed answers to be found, they will be found through many diverse avenues of approach—in the European Recovery Program, in our direct relations with the Soviet states, in the very mechanisms by which our policies are developed and determined. Yet you will not find it inappropriate that we fix attention on one relatively isolated, yet not atypical, area of foreign affairs—on atomic energy. It is an area in which the primary intent of our policy has been totally frustrated. It is an area in which it is commonly recognized that the prospects for success with regard to this primary intent are both dim and remote. It is an area in which it is equally recognized that this failure will force upon us a course of action in some important respects inconsistent with our original purposes. It is an area in which the excellence of our proposals, and a record in which we may and do take pride, have, nevertheless, not managed quite to quiet the uneasy conscience, nor to close the mind to further trouble.

Our Efforts for International Control

The history of our policy and our efforts toward international atomic control is public; far more important, it has from the first aroused widespread interest, criticism, and understanding, and has been the subject of debates in the Congress and the press and among our people. There may even be some notion of how, if we had the last years to live over again, we might alter our course in the light of what we have learned, and some rough agreement as to the limits within which alternative courses of action, if adopted at a time when they were still open to us, could have altered the outcome. The past is in one respect a misleading guide to the future: it is far less perplexing.

Certainly there was little to inspire, and nothing to justify, a troubled conscience in the proposals that our government made to the United Nations as to the form which the international control of atomic energy should take.[1] These proposals, and some detailed means for implementing them, were explored and criticized, elaborated, and recommended for adoption by fifteen of the eighteen member-nations who served on the United Nations Atomic Energy Commission. They were rejected as wholly unacceptable, even as a basis for further discussion, by the three Soviet states, whose contributions to policy and to debate have throughout constituted for us a debasingly low standard of comparison.

This September the Commission made its third, and what it thought was its final, report to the General Assembly, meeting in Paris. It recommended to the Assembly that the general outlines of the proposed form of international control be endorsed, that the inadequacy of the Soviet counter-proposals be noted, and that the Commission itself be permitted to discontinue its work pending either a satisfactory prior negotiation between the permanent members of the Security Council and Canada, or the finding by the General Assembly that the general political conditions which had in the past obstructed progress had been so far altered that agreement now appeared possible. The Assembly did, in fact, accept all the recommendations but one. It asked the Commission to continue meeting. In its instructions to the Commission, however, the Assembly failed to provide affirmative indications of what the Commission was to do, or to express any confidence in the success of its further efforts; in fact, one might dismiss this action as no more than an indication of unwillingness on the part of the Assembly to accept as permanent the obvious past failures of the Commission to fulfil its mandate.

[1] The essential elements of these proposals were: (1) the internationalization of the key activities in the field of atomic energy; (2) the complete abolition of secrecy; (3) the prohibition of national or private activities in fields menacing to the common security; (4) the intensification of cooperation between nations in research, development, and exploitation; and (5) the abrogation of the right of veto, both in the management of the affairs of the international development authority and in the determination of transgression against the covenant.

Yet we may recognize that more is involved in this action, that we will come to understand in the measure in which the nature and purposes of our own preoccupation with the problem become clearer. In part, at least, the Assembly asked that this problem of the atom not be let lapse because it touches in a most intimate, if sometimes symbolic, way the profoundest questions of international affairs; because the Assembly wished to reaffirm that these problems could not be dismissed, that these issues could not be lost, whatever the immediate frustrations and however obscure the prospects. The Assembly was, in fact, asking that we let time and nature, and human reason and good example as a part of that nature, play some part in fulfilling the age-old aspirations of man for preserving the peace.

Our Political Traditions of Persuasion and Free Discussion

In any political action, and surely in one as complex and delicate as the international act and commitment made by the United States with regard to atomic energy, far more is always involved than can or should be isolated in a brief analysis. Despite all hysteria, there is some truth to the view that the steps which we took with regard to atomic energy could be understood in terms of the terror of atomic warfare. We have sought to avert this; we have further sought to avert the probable adverse consequences of atomic armament for our own institutions and our freedom. Yet more basic and more general issues are involved, which, though symbolized and rendered critical by the development of atomic energy, are in their nature not confined to it; they pervade almost all the key problems of foreign policy. If we are to seek a clue to the troubled conscience with which we tend to look at ourselves, we may, I think, find it just in the manner in which we have dealt, in their wider contexts, with these basic themes.

The first has to do with the role of coercion in human affairs; the second, with the role of openness. The atomic bomb, born of a way of life, fostered throughout the centuries, in which the role of coercion was perhaps reduced more completely than in any other human activity, and which owed its whole success and its very existence to the possibility of open discussion and free inquiry, appeared in a strange paradox, at once a secret, and an unparalleled instrument of coercion.

These two mutually interdependent ideals, the minimization of coercion and the minimization of secrecy, are, of course, in the nature of things, not absolute; any attempt to erect them as absolute will induce in us that vertigo which warns us that we are near the limits of intelligible definition. But they are very deep in our ethical as well as in our political traditions, and are recorded in earnest, eloquent simplicity in the words of those who founded this nation. They are, in fact, inseparable from the idea of the dignity of man to which our country, in its beginnings, was dedicated, and which has proved the monitor of our vigor and of our health. These two ideals are closely related, the one pointing toward persuasion as the key to political action, the other to free discussion and knowledge as the essential instrument of persuasion. They are so deep within us that we seldom find it necessary, and perhaps seldom possible, to talk of them. When they are challenged by tyranny abroad or by malpractice at home, we come back to them as the wardens of our public life—as for many of us they are wardens of our lives as men.

In foreign affairs we are not unfamiliar with either the use or the need of power. Yet we are stubbornly distrustful of it. We seem to know, and seem to come back again and again to this knowledge, that the purposes of this country in the field of foreign policy cannot in any real or enduring way be achieved by coercion.

Our Aversion to Coercion and Secrecy

We have a natural sympathy for extending to foreign affairs what we have come to learn so well in our political life at home: that an indispensable, perhaps in some ways *the* indispensable, element in giving meaning to the dignity of man, and in making possible the taking of decision on the basis of honest conviction, is the openness of men's minds, and the openness of whatever media there are for communion between men, free of restraint, free of repression, and free even of that most pervasive of all restraints, that of status and of hierarchy.

In the days of the founding of this republic, in all of the eighteenth century which was formative for the growth and the explicit formulation of our political ideals, politics and science were of a piece. The hope that this might in some sense again be so was stirred to new life by the development of atomic energy. In this it has throughout been decisive that openness, openness in the first instance with regard to technical problems and to the actual undertakings underway in various parts of the world, was the one single essential precondition for a measure of security in the atomic age. Here we met in uniquely comprehensible form the alternatives of common understanding, or of the practices of secrecy and coercion.

In all this I pretend to be saying nothing new, nothing that has not been known to all thoughtful men since the days of Hiroshima; yet it has seldom come to expression; it has been overlaid with other preoccupations, perhaps equally necessary to the elaboration of an effective international control, but far less decisive in determining whether such a control could exist. It is just because it has not been possible to obtain assent, even in principle, even as an honest statement of intent or purpose, to these basic theses that the deadlock in attempting to establish control has appeared so serious, so refractory, and so enduring.

Our Failure in Winning Acceptance for These Principles

These words have an intent quite contrary to the creation of a sense of panic or of doom. Yet we need to start with the admission that we see no clear course before us that would persuade the governments of the world to join with us in creating a more and more open world, and thus to establish the foundation on which persuasion might so largely replace coercion in determining human affairs. We ourselves have acknowledged this grim prospect and responded by adopting some of the very measures that we had hoped might be universally renounced. With misgivings—and there ought to be misgivings—we are rearming, arming atomically, as in other fields. With deep misgivings, we are keeping secret not only those elements of our military plans, but those elements of our technical information and policy, a knowledge of which would render us more subject to enemy coercion and less effective in exercising our own. There are not many men who see an acceptable

alternative to this course, although there apparently are some who would regard it as a proof of the shallowness and insincerity of our earlier renunciation of these ways. But whether, among our own people or among our friends abroad, or even among those who are not our friends, these measures which we are taking appear excessive, or on the whole insufficient, they must have at least one effect. Inevitably, they must appear to commit us to a future of secrecy, of coercion, and to an imminent threat of war. It is true that one may hear arguments that the mere existence of our power, quite apart from its exercise, may turn the world to the ways of openness and of peace. Yet we have today no clear, no formulated, no in some measure credible account of how this may come about. We have chosen to read, and perhaps we have correctly read, our past as a lesson that a policy of weakness has failed us. But we have not read the future as an intelligible lesson that a policy of strength can save us.

When the time is run, and that future become history, it will be clear how little of it we today foresaw or could foresee. How then can we preserve hope and sensitiveness which could enable us to take advantage of all that it has in store? Our problem is not only to face the somber and the grim elements of the future, but to keep them from obscuring it.

Our recent election has seemed to touch this deep sense of the imponderable in the history of the future, this understanding that we must not preclude the cultivation of any unexpected, hopeful turnings. Immediately after the election people seemed stirred, less even by the outcome itself, than by the element of wonder; they would tend to say things like: "Well, after this perhaps we need not be so sure that there will be a war." This sense that the future is richer and more complex than our prediction of it, and that wisdom lies in sensitiveness to what is new and hopeful, is perhaps a sign of some maturity in politics.

The Importance of Style

The problem of doing justice to the implicit, the imponderable, and the unknown is, of course, not unique to politics. It is always with us in science, it is with us in the most trivial of personal affairs, and it is one of the great problems of writing and of all forms of art. The means by which it is solved is sometimes called style. It is style which complements affirmation with limitation and with humility; it is style which makes it possible to act effectively, but not absolutely; it is style which, in the domain of foreign policy, enables us to find a harmony between the pursuit of ends essential to us, and the regard for the views, the sensibilities, the aspirations of those to whom the problem may appear in another light; it is style which is the deference that action pays to uncertainty; it is above all style through which power defers to reason.

Need To Reaffirm Our Values

We need to remember that we are a powerful nation.

We need to remember that when the future that we can now foresee deviates so markedly from all that we hope and all that we value, we can, by our example, and by the mode and the style with which we conduct our affairs, let it be apparent that we have not abandoned those hopes nor forsaken those values; we need to do this even while concrete steps, to which we resort to avert more immediate disaster, seem to negate them.

Our past is rich in example. In that other agony, the Civil War, where the foundations of our government were proved and reaffirmed, it was Lincoln who again and again struck true the balance between power and reason. By 1863 the war and the blockade had deepened the attrition of the South. They had also stopped the supplies of cotton to the English mills. Early that year Lincoln wrote a letter to the working men of Manchester. He wrote:

> . . . It is not always in the power of governments to enlarge or restrict the scope of moral results which follow the policies that they may deem it necessary for the public safety from time to time to adopt.
>
> I have understood well that the duty of self-preservation rests solely with the American people; but I have at the same time been aware that favor or disfavor of foreign nations might have a material influence in enlarging or prolonging the struggle with disloyal men in which the country is engaged. A fair examination of history has served to authorize a belief that the past actions and influences of the United States were generally regarded as having been beneficial toward mankind. I have, therefore, reckoned upon the forbearance of nations. . . .

Fifteen months later, a year before Lincoln's death, the battle had turned. He could say:

> . . . When the war began, three years ago, neither party, nor any man, expected it would last till now. Each looked for the end in some way, long ere to-day. Neither did any anticipate that domestic slavery would be much affected by the war. But here we are; the war has not ended, and slavery has been much affected—how much needs not now to be recounted. . . .
>
> But we can see the past, though we may not claim to have directed it; and seeing it, in this case, we feel more hopeful and confident for the future. . . .

In such magnanimity even Grant, at Appomattox a year later, looking beyond the bitter slaughter, looking to nature and to time, could speak to Lee: His troops were to keep their horses; they would need them for the spring plowing.

Each of us, recalling our actions in these last critical years, will be able to find more than one instance where, in the formulation or implementation of policy, we have been worthy of this past. Each of us will mourn the opportunities that may seem to him lost, the doors once open and now closed. Not even in critical times can the sense of style, the open mind, be fostered by issuing directives; nor can they rest wholly on soliciting great actions not yet taken, great words not yet spoken. If they were wholly a matter for one man, all could rest on his wisdom and his sensitiveness—they neither are, nor can, nor should be.

The Spirit of the Open Mind

The spirit in which our foreign affairs are conducted will, in the large, reflect the understanding and the desires of our people; and their concrete, detailed administration will necessarily rest in the hands of countless men and women, officials of the government, who constitute the branches of our foreign service, of our State Department, and of the many agencies which now supplement the State Department, at home and abroad. The style, the perceptiveness, the imagination and the open-mindedness with which we need to conduct our affairs can only pervade such a complex of organizations, consisting inevitably of men of varied talent, taste, and character, if it is a reflection of a deep and widespread public understanding. It is in our hands to see that the hope of the future is not lost, because we were too sure that we knew the answers, too sure that there was no hope.

PRIVATE INDUSTRY AND THE PUBLIC ATOM

David E. Lilienthal

Mr. Lilienthal, Chairman of the AEC, presented the following account of the Commission's industrial policy in an address before the New England Council at Boston on November 19. He explains why the development of atomic energy remains a public responsibility and how the cooperation of private enterprise is being enlisted.

I want to describe the industrial and business policies of the Atomic Energy Commission.

The faster industry develops our present atomic knowledge the stronger we shall be in a military sense. But more is at stake than increasing our military strength. For here is a whole new technology, ripe for development, and from which we may confidently expect new techniques, new processes, leading to basic improvements in existing industrial methods and, eventually, to entirely new industries and new products. Out of all this will surely come a stronger and more productive industry and business, and therefore a stronger people and a stronger country. And in this—in a vigorous people and a developing country—lies the greatest, perhaps the only real assurance of "common defense and security."

Why should there be any difficulty in putting the atom to work? Here is a new technical discovery, or series of discoveries, of major importance. Why can't they be developed, and developed rapidly, by the same method that we've followed successfully in the past? This method has been one of competition in ideas. The ultimate judge of which is the best idea—whether in chemicals or railroads or radio—is the buying public.

That is oversimplifying a bit. But, in general, that has been the American formula that has worked wonders, and it continues to do so. All of American industry began this way, and, except for public utility services, which are now legal monopolies under regulation, American business by and large continues to operate this way. We know that it is a good way, or the over-all results wouldn't be so good. Those results are good in productiveness. More important still, it is a productiveness that does not exact our essential freedoms as its price, but tends to increase the sum total of freedom of choice for the individual.

As everyone knows, this is *not* the way the atomic enterprise began. In contrast with the automobile and the airplane, which began with puttering in little bicycle shops, this technical achievement was a giant at birth, a two-billion-dollar war baby, gestated in secrecy and nourished wholly on government money.

So when this Commission assumed responsibility for atomic energy development two years ago it had handed to it a nationalized enterprise, owned lock, stock, and barrel by the United States. Its predecessor, the Manhattan Project, had one purpose, to produce an atomic bomb and produce it in time. There were neither people nor time nor authority to develop any other of the many potentialities of atomic energy. Particular industries had been assigned particular tasks such as the design, construction, and operation of a plant to separate out Uranium 235 from natural uranium, or to factory-produce the new element plutonium, or to develop and manufacture this or that device, often without knowing what the whole mechanism was to be used for. There was little problem of incentives: the war supplied the incentive.

The success of the whole mission was an accomplishment of the first magnitude, but it was *not* an example of the development of an industry under the tested American formula. It was almost the exact opposite.

This atomic enterprise, then, began as a nationalized industry to do a war job. The war job over, what was to be done with it? Congress spent more than a year studying just that problem. And although it was a Congress by no means disposed toward departing from the usual industrial formula, the conclusion was that at this stage of development the government must continue to own, supervise, and direct this undertaking.

Why? Why not sell it off to private industry as a surplus war asset, just as with scores of chemical plants and steel mills? With the war out of the way, why not get this new and promising technical development back on the historic track?

What stands in the way is not ideology or doctrine, but facts—the facts about nuclear reaction which no arguments about ideology will change. What we have here is a practical question, and not an abstract debate. We have something big here, a great asset. Essentially that asset is knowledge. Now, what is the best way of getting the most benefit from this asset?

The Atomic Energy Commission, appointed two years ago, is developing what it believes is a good general answer to this question.

Our policy and practice can be stated this way: First: develop the many different potentialities of atomic energy and of nuclear reactions in the way that comes closest to the way this country has followed in developing other new fields of knowledge and technical advance. Second: where we depart from that way the departure should be justified, not by some ideological, doctrinaire, or abstract reason, but because of the force of facts, distinctive and special facts about the atom that require such departure.

The essential facts about nuclear reactions should be better known and understood, for it is upon them that policy must rest. These facts are by no means all secret, nor are they highly technical nor abstruse; indeed they are no more difficult than the rock-bottom facts about steam engines or electricity or automobiles.

Such public knowledge is of the greatest importance, for the Atomic Energy Commission's responsibility is to the people of the country. This is in every sense a public enterprise. But it is more than that. The issues entrusted to this Commission are of fateful consequence to the future of mankind. It is therefore essential that our actions be conducted within the framework of rigorous public accountability and public criticism. And to make this kind of accountability effective, the facts must be known.

Take the basic ingredients of this undertaking as it is at present. These are known as fissionable materials,

Uranium 235 and plutonium. These ingredients are being produced today in huge Commission-owned factories that are among the largest industrial establishments in the country. In certain quantities these basic ingredients can be made to explode.

Well, TNT is also highly explosive, but we don't for that reason turn the development and production of TNT over to a government agency. The difference lies in the difference in the magnitude of explosiveness. In the past fifty years, by intensive development, the explosive effect of TNT was doubled. Overnight, the nuclear reaction multiplied the power of the most effective TNT by many millions of times.

These basic materials, U-235 and plutonium, must be handled with knowledge and with elaborate safety measures; otherwise they can be dangerous indeed. The safety measures cannot be left to individuals to determine on the basis of what they consider is economically justified, nor left to the kind of risks particular individuals are prepared to take. The safety of the whole public in the surrounding area must be the determining factor.

Consider another aspect of these basic materials, U-235 and plutonium. They have this physical characteristic: they can be used for purposes of destruction or for peaceful purposes.

The identical raw materials, the identical research, the identical industrial and chemical processes that turn out these ingredients for atomic weapons are the same materials and research and processes and plants that turn out fissionable materials to be used in a future atomic furnace to produce energy for peaceful purposes. And the amounts needed for a single bomb, or for a formidable array of bombs, is so small, whereas the devastation that could be wrought by them is so great that these facts of common origin, common knowledge, and common method of production are dominant facts in any sensible industrial policy for the development of atomic energy.

Add to this the fact that the actual fabrication of an atomic weapon is a small, though very important, part of the total effort or skill involved, when compared with the production of the fissionable materials of U-235 or plutonium, and you have a set of facts that distinguish this situation from any technical development problem with which we have ever had to contend.

Other facts could be enumerated. For example, the atomic power plant of the future will not only produce power from nuclear fuels but, like the reactors we have in actual operation today, will at the same time produce more fissionable materials. These materials thus created in the power plant will be useful for bombs as well as for more power production.

It is clear that, as things now stand, an atomic furnace or an atomic power plant is virtually an atomic bomb arsenal. The clandestine diversion of even small amounts of fissionable ingredients becomes a very serious matter.

It is this same set of facts, of course, that makes it a matter of life and death that any system of international control of atomic weapons should be foolproof and rascal-proof, and not dependent merely upon paper agreements or expressions of national good intent.

There is today no international control. Nor is this likely in the near future. So we are forced to maintain a shield of secrecy about vital parts of this huge business. Now, of course, secrecy about an industrial process is not unheard of in business. But the stakes of secrecy were never as high as they are in this undertaking. And never in industrial competition was it worth as much to a competitor to uncover secret knowledge as in this international rivalry.

To adapt our ordinary American formula of the widest competition in ideas and development to an area where considerable secrecy is obviously necessary is not a simple problem. The solution won't be found in any such suggestion as the one seriously made a little while ago that we should put into one neatly tied bundle what are called our "military" research and technical knowledge, keep that in military hands and secret; and then turn what is called the "industrial side" over to private industry for competitive development. Such a quick-and-easy answer is nonsense, for there can simply be no such neat packages. How to make and operate machinery to separate the atoms of uranium having different atomic weights—the knowledge that is the basis of the huge plant at Oak Ridge —is certainly industrial knowledge. But it is the very sort of knowledge that must be held secret as long as possible. The same thing is true in our current work in the development of entirely new processes and the improvement of existing ones. It applies, too, to the design and development of machines to extract useful power from the enormous heat engendered by the splitting of uranium atoms in an atomic furnace or, as it is usually called, a nuclear reactor.

Our task would be far easier if the facts were otherwise; if, for example, the design and development of an atomic furnace to produce useful power—something that is certain to come —could be turned over to the open competition-of-ideas system that has worked so well in the past. But the knowledge and know-how required to develop such a useful power reactor is the kind of information and skill our international competitors most need to have for military reasons.

From all these facts does it follow that the great benefits to atomic development that private industry and business can contribute must be denied to us? Are there no ways by which American industry can participate in the industrial aspects of this huge project?

Clearly, the usual industrial and business formula is not applicable, certainly not at this juncture in world events, and problably never will be completely. This undertaking is so close to issues of life and death for our country that the kind of development — the amount of manpower and funds, the direction and the pace of the development — these must of necessity be determined not by private considerations but considerations of the public security. Under our Constitution such decisions are entrusted to government responsible to the people as a whole.

But just because the usual formula cannot be applied, the Commission does not believe that it cannot be so modified and adapted as to secure many of its proven benefits to the country and to industry.

Furthermore, areas will appear that can be separated off and left to the usual forces of the competitive system. But this process—the gradual de-nationalization of the atom—must be on a case-by-case basis.

There already appear to be at least three areas in this undertaking where private business can operate in substantially the usual manner. The first of these is in the mining, milling, and processing of uranium ores into high-grade concentrates, within this country. The usual incentives of pri-

vate profit, and risk of loss, and private initiative should operate to do this part of the job. No essentially new processes and no large chunk of information that need to be kept secret are involved. This appears to be working well: new capital is being invested, and there is great activity on the Colorado plateau, where uranium is found.

A second area for private development is in the preparation of radioactive tracer compounds, and their use in private industrial laboratories and in process control. Here again we have encouraged private investment and private development and have instituted courses to train the employees of private companies to use these materials safely and effectively. As industry finds more and more practical use for these tracers a rather considerable business will undoubtedly grow up.

A third area is in the manufacture and maintenance of radiation-detection instruments. During the war these instruments were chiefly supplied by a single concern or by direct government production. Today some forty concerns, all still rather small in size, are making these instruments. The business will grow, and better instruments will be developed as the market expands.

When we come to the design and the operation of reactors that produce fissionable material, the difficulties really begin. But they are not insuperable. True, the ownership and full responsibility for such activities cannot be delegated to private hands.

It is also true that a case could be made that this development work and the operation of these plants should be by the government directly. I have no doubt that if given flexibility and adequate authority a government agency could do these jobs and do them effectively.

But there is a better course, and this is the one the Commission has adopted.

The actual operations of the Oak Ridge and Hanford plants the Commission has delegated to two leading private industrial firms, General Electric Company, and Carbide & Carbon Chemicals Corporation. Other parts of this huge enterprise have been delegated in similar fashion. In this way the country has drawn upon and benefits by the experience and industrial skills of leading private corporations.

But this delegation to private industry is not the usual pattern of American industrial development, and I do not want to be understood to mean that it is. For these private firms take no financial risks. Neither do they make any profit, in the commercial sense. They do make an investment in people, their employees. These people become proficient in a new technology, gain new ideas adaptable to their companies' processes or products. From their new skills, in time they can expect a return. Other incentives apart from profit do exist, among them the incentives that strongly motivate men in pioneering a new field. But the incentive of relatively immediate profit is lacking. We have not yet been able to devise other incentives that fully take its place.

The worrisome and heavy responsibility for security and secrecy the Commission cannot and does not delegate. Decisions as to general course of the venture, expansion or contraction, and other major questions of policy continue to be vested in the Commission which is held responsible for the results by the Congress, the President, and the public.

In the development of wholly new processes—such as a new chemical process for the recovery of plutonium and uranium from used fuel material, upon which great effort and huge sums are now being expended—the Commission is able to come somewhat closer to the competition-of-ideas thesis. In this one case (in addition to General Electric) the following leading chemical firms of the country are all working on the problem with their own personnel: Standard Oil Development Company, Carbide & Carbon Chemicals Corporation, Kellex Corporation, Blaw-Knox Company, Monsanto Chemical Company, and Dow Chemical Company. Other chemical companies will be brought in later, as this work proceeds.

As to the design and development of reactors for the production of useful power, the Commission is directing an extensive program in Commission-owned facilities, chiefly at the Argonne Laboratory near Chicago, and the new Knolls Atomic Power Laboratory at the G. E. works near Schenectady.

At present there are atomic reactors operating at Los Alamos, New Mexico; at Oak Ridge, Tennessee; at the Argonne, Chicago; and at Hanford, Washington. Another reactor to be used for research purposes will start up early next year at the Commission's Brookhaven National Laboratory on Long Island. Two new reactors for power are now well along in the design stage. Actual construction of the reactor to be located at the Knolls Laboratory near Schenectady will start early next year. Design for a third reactor to be used for the study of reactors themselves is nearly completed. Preliminary planning on still other reactors such as for ships and submarines has begun.

This is a Commission-financed and Commission-directed program. No one firm is equipped with sufficient men, money, or knowledge to take on the responsibility for this work. But industry will send men to the establishments, men who will stay for periods of time and join in the actual work. In this way, firms will be able to keep up with developments of possible use in their own industries. The laboratories will benefit by the new and fresh ideas these men may bring to the job.

No private concern has yet come forward with a proposal to build a reactor at the expense of the company. There is a good reason for this. These reactors are very expensive experiments. To the cost of the structure itself must be added the expense involved in necessary safety and health measures, in heat transfer and chemical processing facilities, in people to do the operating and maintenance and research, and in the buildings and facilities needed to maintain the people. Altogether the cost of a reactor runs to something like fifty million dollars. The prospect of a return is remote, and the money risk is great.

No private capital in these amounts is forthcoming or is likely to be forthcoming in the next decade even if security considerations made it possible to turn such development over to private hands. This is understandable. Much of the knowledge necessary for the development of useful reactors has yet to be acquired in the laboratory. To work out the many-sided problems involved in this development we must draw upon a great variety of scientific and engineering talent. Such a corps of research and development men, including engineers from industry, is being brought together to work in concert, and we expect that leading industrial firms will, as time goes on, become part of this development in a manner analogous to that employed in the case of process development.

THE ATOMIC ENERGY DEBATE AT PARIS
A FRENCH APPRAISAL

François de Rose

M. François de Rose has been the acting French Representative on the UNAEC since its inception. During the proceedings of the General Assembly at Paris, which M. de Rose has reviewed in this article for the **Bulletin,** he served as advisor to the French delegation. The views presented here are expressions of private opinion, and are not to be considered as representing the judgment of the French Government.

It will be remembered that the debate on atomic energy had been placed on the agenda of the General Assembly by the Security Council, which had approved, (the U.S.S.R. abstaining), the recommendations by the Commission that its three reports be transmitted to the Paris session.

Assembly Debates on Suspension of Atomic Energy Commission

In its third report the Commission had registered the impasse in which it found itself, noted that this impasse was due to the refusal by the Soviet Union to bring its conceptions of international relations up to date in the age of mass-destruction weapons, and recommended that work be suspended on this problem until that situation no longer existed.

Faithful to the point of view his delegation had already put forward in 1946, Mr. Vishinsky in his first speech in Paris tried to have atomic energy debated together with disarmament.[1] This was refused by the Assembly, and the reports of the UNAEC were put at the top of the agenda of the political committee.

It would be of no interest to relate the ups and downs of the seven or eight-week discussion. There was much repetition of what had been said in New York for more than two years with no more substantial results on the fundamental points.

It would seem, therefore, more useful to concentrate on the two or three points on which there was a real debate, for they provide the background of the future discussions in the United Nations Commission.

Canada first introduced a resolution which called for approval of the past work of the Commission and for the suspension of its work in the manner recommended by the third report. The U.S.S.R., on the contrary, proposed that the Assembly declare that the work of the Commission had so far yielded no positive results and recommend that the Commission resume its activity, working this time along the lines laid down by the previous General Assembly resolutions on the matter.[2]

It was soon evident that although the great majority of the nations represented were not ready to support the Soviet contentions that the UNAEC had achieved no substantial results, or ignored its mandate, they would nonetheless be reluctant to draw the same conclusions as the Commission and to approve the suspension of its efforts to solve the problem. The delegates feared that, as the reports of the Commission would not be read by a wide audience, public opinion would not understand why the United Nations should seem to have abandoned so important a problem.

Even the suggestion by New Zealand that the six permanent members of the Commission should consult and report to the next General Assembly was not considered sufficient. It must be added that the Soviet representative derided this proposal (which was eventually included in the resolutions voted by the Assembly), saying that the negative results of such consultations were known in advance.

The question therefore arises whether the Soviet Union is really hoping and working for an agreement or whether she simply wants to keep the discussion going. However, she was far from being alone in her desire to see the work of the Commission resumed. Australia introduced a formal amendment to that end which was accepted by Canada. France, Belgium, the United Kingdom and the United States expressed their concurrence; and the necessary two-thirds majority was thus in the making.

It remained for the Assembly to formulate the mandate for the Commission in this new phase of its activity. Syria and India were the chief spokesmen of the opinion that the Commission should prepare a draft treaty, that is to say, should complete the whole task originally assigned to it. This met with serious objections for, in the absence of agreement on the methods of control, a treaty thus prepared would reflect the majority ideas. The U.S.S.R. would not participate in its elaboration, and the views of the others would crystallize in a form which would make an eventual adjustment much more difficult.

The Assembly accordingly decided that it would not be wise to follow this course nor to start all over again a discussion which had to some extent added to the international difficulties of the last two years. The text eventually adopted instructs the Commission to "proceed to the further study of such of the subjects remaining in the program of work as it considers to be practicable and useful."

Russian Proposals for Simultaneous Commitments and Enforcement

A further point to be hotly debated in Paris was whether or not the commitments on prohibition and control would have to come into force simultaneously.

In the course of the debates in New York, Mr. Gromyko had always maintained that the prohibition of atomic weapons should come into force as a first step and that the negotiations on control should be dealt with afterwards. This position was so clearly untenable that Mr. Vishinsky abandoned it in his second speech and, claiming that he was making a great

[1] The Soviet states proposed that atomic weapons be prohibited and that the other armaments of the five permanent members of the Security Council be reduced by one-third.

[2] The resolution of January 26, 1946, creating the UNAEC, and the resolution on disarmament of December 14, 1946.

concession, introduced his point on simultaneous commitments and enforcement.

The move was well calculated, so well that one wonders whether Russia's previous attitude had not been adopted in order to induce the other members of the Commission to break the negotiations on that point. Had not the majority explained in its report that the main cause for the impasse was Russia's refusal to agree to the essential elements of effective control, the whole debate would have been thrown into the greatest confusion by Mr. Vishinsky's proposal. I am not sure that outside the walls of the room in which the debate took place all the misgivings about the fairness and wisdom of the position of the majority on this point have vanished.

For the Assembly the question was whether such a proposal offered a useful basis for the resumption of the work of the Commission. There are, it seems, some good reasons for answering this question in the negative. First, it brought nothing new as far as the methods by which an effective international control could be set up. Then, it completely ignored the idea that there should be some stages in the establishment of such control. Finally, if it is true, as the majority believes, that the idea of stages could not be dropped without dropping the political and technical guarantees indispensable to the success of the whole scheme, the Soviet proposal still amounted to asking for the destruction of atomic weapons before the Agency could be in a position to guarantee that the machinery of safeguards was in full operation.

The idea of simultaneity can only fit into the pattern of the Soviet proposals of June 11, 1947, which as far as control goes would only declare all facilities eligible for periodic inspections. Such a declaration could certainly accompany the prohibition and destruction of all weapons; but what security would that afford for the signatory countries, including the U.S.S.R.?

To sum it up, the debate in the General Assembly has not brought a solution any nearer either on the political plane or at the level of the control machinery. On this last item, which had been the core of the discussion at Lake Success, it remains to be said that a few spoke in high terms of the great ideas which were first introduced by the Acheson-Lilienthal Report.

The proposal for ownership of ores met with some criticism which will have to be considered seriously if the time comes to draft a final treaty. India thought that there was no reason to propose international ownership of one source of energy if the same was not done for oil and coal, and South Africa explained that, since her uranium production would be a by-product of her gold mines, a very careful study of the Commission's proposal on ownership of ores would have to be made before her Government would know that the development of this vital resource was not endangered.

Both countries abstained for these reasons.

New Approach to East-West Problems

When we examine this discussion, there seems to be little reason for rejoicing.

It is probably a matter of one's political opinion whether Mr. Vishinsky has convinced anyone that the majority plan aims at giving the United States a grasp over the economic lives of other nations or whether the West has succeeded in showing that the Soviet Government is prevented by its very philosophy from believing in and working for a lasting agreement. But everyone can see that motives were questioned and that agreement was just as remote as in the probably less talented but more soberly conducted discussions at Lake Success.

What of the future? The writer, having introduced before the Commission in the name of the United Kingdom, the United States, and his own country, the recommendation that the work be suspended, might be expected to say that little can be hoped for as long as there is no acceptance by the U.S.S.R. of "the nature and extent of participation in the world community required of all nations in this field."

Yet the UNAEC cannot claim exclusive wisdom for itself, and the General Assembly, although apprised of the reasons for the above-mentioned recommendations, has taken a different view. A new fact has been created from which we must try to extract all the good that is possible. In its operative part the resolution recommends first that there should be consultations among the six permanent members of the Commission. In spite of the unfavorable Soviet reaction to such consultations it seems that they might offer a new line of approach to the problem which has baffled our efforts for the last two years and a half.

There is nothing incongruous in the suggestion that a thorough examination of the problems which now divide East from West, with a view to arriving at a settlement, should be initiated by a talk on atomic energy. Although other problems may, in the eyes of the public, appear fraught with more immediate dangers, this one might well outlive the solution of the others. However, it would be beyond the scope of this article to discuss whether and when such a conversation should be launched. But it might be useful to explain the new line of approach which is referred to above.

The Commission, in its past examination of the problem, has more or less worked upwards from the technical evidence furnished to it to the complete set of safeguards which are embodied in the second report. The Soviet representatives have rejected the results of this procedure, and objected to the procedure itself. Would it be helpful to try the alternative approach of working downwards from broad principles to the details of application?

Here is one example of what I have in mind: The Russians have always said that the right to conduct air surveys was quite unacceptable to them. Would it not be useful to ask them whether they agree that there can be no security if nations can permanently seal off certain parts of their territories from international inspection? The whole philosophy of the majority plan could probably be reduced to no more than five or six principles of this kind, for which the evidence has been gathered. I know that the Soviet Government might be even more reluctant to discuss broad principles than specific proposals. But it could also be argued that the past failure of our work compels us to think anew and that if we fail again we will at least have shown some ingenuity in our methods and consistency in our purpose.

The second thing which the General Assembly has recommended is that the Commission be reconvened and that it examine some items on its program of work.

In the light of the Commission's third report the items which remain on that program are dependent either on an agreement on the methods of control or on "the conditions of world security," that is to say, that they must be part of a political settlement.

Problems in the first category, such as those relating to administration or financing, can only be discussed on the basis of the functions to be performed by the control agency. The Soviet states would not participate in an attempt to solve them, and the majority would find themselves involved in a discussion which bore no relation to reality. Would the General Assembly be any more enlightened if, next year, it were offered proposals for the salary of the doormen at the agency's headquarters, but no suggestion as to where the headquarters should be located, the matter being too highly political?

This leaves one possible course: to tackle the dreaded political problems of the stages of the transition from national to international control and of the principles governing the geographical locations of dangerous activities and facilities.

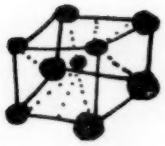
Wisdom of Asking Russians for Precise Proposals on Stages and Quotas

The latter question—the question of quotas—is the only part of the majority proposal which has been referred to in sympathetic words by Mr. Vishinsky. Would it not be wise for the Commission to follow Mr. Ramadier's suggestions in his last speech and ask the Russians to submit some precise proposals on this particular problem?

No one could exaggerate the difficulties of these two problems nor even the risks attached to examining them in public. To discuss "stages" means discussing the timing of the procedure through which the United States is divested of her secrets and the Soviet Union is penetrated by international personnel. Is this worth risking, for the sake of enlightening the General Assembly's debate, in the absence of agreement over the methods of control? Forty nations have given their approval to the majority proposals, and some of those who abstained made constructive criticisms. Can we consider that the great ideas which embody our only hope against the misuse of atomic energy are so thoroughly consolidated as not to be jeopardized by a new discussion following two years of fruitless efforts?

All these are matters to be pondered over by governments. Clearly, it was the political questions which were in everyone's mind at Paris, and these will reappear in 1949 in the same form unless the Commission is able to reflect the results of fruitful thinking in the interval.

CAN ATOMIC WEAPONS KEEP THE PEACE?



N. F. Mott

Dr. Mott is Professor of Theoretical Physics at the University of Bristol, and president of the British Atomic Scientists' Association. We reprint his discussion of this most important question from the **British Atomic Scientists' News**, Vol. II, No. 2.

The Atomic Scientists' Association was founded primarily to advocate the International Control of Atomic Energy, which it believed to be an important step towards the avoidance of war. The attempt to secure agreement on this issue having for the time being failed, it still remains the aim of the Association to press for any measure in its own province which in the view of its members will make war less likely. The purpose of this article is to examine the probable effects on the chances of war of one step which it is possible to take. It is suggested that either as an Association or as individuals working through other organizations, members should urge the governments of this country and of the United States to make a declaration as follows: *That in any future conflict they will not bomb civilian centres of population either with atomic or with any other weapons, unless our own cities or those of an ally are first attacked in this way.*

The purpose of such a declaration would be the renunciation of the *threat* of strategic bombing, envisaged as an independent operation and in the first place unsupported by large scale land operations, as a means of imposing the will of one country on another. There is no doubt that the United States, and to some extent this country, do offer such a threat today. Economic aid as in the Marshall Plan, supported in the last resort by air power and the atomic bomb used in this way, is America's answer to Russia's chosen weapons, Communist penetration and the ultimate threat of the Red Army. The government of the United States has not, of course, threatened to use the bomb on any specific occasion, or stated that strategic bombing is a definite part of their military plans. But neither have they denied it, and in view of the recent decision of Congress to expand the air force rather than to build up a more balanced armed power, it is natural for the governments of Eastern Europe to believe that the threat exists. A glance, too, at the American press will show that it is widely accepted there that, if war should be forced on their country, it is in the first place by strategic bombing that the United States will wage it.

Only ten years ago it was believed in Western Europe and America that the mass bombardment of cities was a crime of which only the Nazis were capable. Since then our notions of war have changed. Area bombing was developed by the Royal Air Force, first in retaliation, then as a major act of war. Dresden was destroyed, crowded with refugees, within four months of Germany's defeat. Japan was bombed into surrender. These acts have to be set against the horrors committed by the Nazis, and in fact derive from them. Nevertheless, it is no light matter to destroy an ancient city which might otherwise have stood and been a joy to mankind for generations, let alone to kill 50,000 of its inhabitants. During the present period of peace, we in America and England, as the guardians of western civilization, should think very carefully before choosing as our instrument of policy the threat of further mass destruction of this type.

Strategic bombing as a method of warfare has for various reasons caught the imagination of certain circles in the United States and Britain. It makes full use of the productive power and technical genius of these countries, both in aviation and in the manufacture of atomic weapons. It uses weapons in which the United States is likely to retain great superiority over Russia for many years ahead. It is a method by which, ac-

cording to some views, war can be waged without the heavy casualties that the employment of land armies entails. In asking for a renunciation of strategic bombing, it may then be considered that a change is demanded which would shift the balance of power in favour of Russia. Attacks on American air policy are indeed very commonly made by sympathizers with the aims of the U.S.S.R. Therefore, those who do not favour the aims of the U.S.S.R., and would like to see Western Europe freed from the fear that the Communist parties there may in the last resort call in the Red Army, might hesitate to ask for a declaration against strategic bombing. They will certainly refuse to do so if they believe that the threat of strategic bombing is sufficient to restrain Russia, impose a Pax Americana and give Europe the period of peace which it so badly needs.

Limitations of Strategic Bombing

Whether or not this is the case depends on certain facts about strategic bombing, which have been said often before, but which are worth repeating. At present the American air force is probably capable of delivering a certain number of atomic bombs to Moscow and other cities and of doing much damage, but until a very great expansion has been achieved — and probably even then this damage would be much less than the Germans inflicted by occupying half the country —it would not be sufficient to prevent the advance of the Red Army to the Channel ports. Western Europe could hope only for an eventual American liberation after a Russian occupation. In view of the inferiority of manpower of the United States compared with the Russian bloc, this is only likely to be achieved through the liberal use of air power and atomic weapons. The prospect for Western Europe is not inviting. For England the prospect is less desperate, but our own survival in such an event would depend on the defeat of the Russians before they produced atomic bombs. Europe's defence by a strategic air force depends then on the power of its threat to keep the peace; should it fail the prospects are that our civilisation will be destroyed.

Any country, before deciding to build up armaments of a given type, ought to consider the effects of its actions on its possible enemies. It is a commonplace that the effect of rearmament by one side is usually to provoke rearmament by the other. Russia's answer to the United States' strategic air force, however, is unlikely to be an attempt to build a bigger one, even if they have the technical capacity. Their most effective answer will clearly be to deny to the Americans the bases from which Russia can be attacked. These bases are the countries on their border. It is, of course, true that the range of modern bombers makes attacks from very great distances possible. Nevertheless this does not minimise the importance of bases near the target. Unescorted bombers flying long distances over well defended hostile territory would be subject to a very high casualty rate, which might well be great enough to destroy the effectiveness of the attack.

Russian policy at present is clearly aimed at securing that in countries near to her own territory the governments shall be friendly to herself and ultimately under her control. The aim of Anglo-American policy in Europe is to safeguard the independence of the west and perhaps to restore some measure of freedom to countries further east. The dilemma for the west is to gauge the cause of Russian expansionism. If it is due to fear of strategic bombing, then the building up of a strategic air force will accentuate that fear, and provide the strongest incentive to the Russians to do what we most wish to prevent, namely to occupy Western Europe before the air force is ready. If, on the other hand, the causes of this expansionism lie deep in Russian policy, and they would try to dominate their neighbours whatever the western powers do, then opposition to strategic bombing savours of appeasement. It is anyone's guess where between these two extremes the truth lies; but we can hardly doubt that, while their expansionism is a product of their history and their doctrine, it is accentuated by the threat of atomic bombardment.

Means and Ends

Let us admit that military power is necessary in order to give Europe the kind of security that she needs. The question then is, what kind of weapons and what kind of military policy will give the greatest security? Obviously security can best be obtained through weapons and policy which provide the greatest deterrent in the event of aggression, but the least threat if no aggression occurs. Strategic bombing fails on both counts; though likely to cause destruction and misery and permanent loss to mankind, it would not be decisive, since it would swing world opinion against the powers employing it and lead to the rapid Sovietisation of Europe and Asia. Moreover, it constitutes a standing threat of the most provocative kind, against which any Russian government is bound to take steps. The real deterrent, and the only effective one, is the threat of a long war, in which the whole productive effort of the American continent could be brought into play, and the Russian armies brought to defeat in the countries that they had over-run. Admittedly strategic bombing would play a part in such a war, but it is not the part for which preparation should be given first priority in time of peace. What is necessary in peacetime is to make plans to hold such areas as can be held while all available resources are mobilized. This would be the way to win a long war, but could not be considered a threat to a peaceful Russia.

The argument that can be brought against such a policy is the assertion that future wars will be decided in the first few days by strategic bombing, and that a nation with no forces ready for instant retaliation will be defeated. Unfortunately the time may come when this will be true. It is not true yet, for big continental countries such as the United States or Russia. It will not even become true when Russia first has atomic weapons. It will need a very large number of such weapons, and as yet quite unenvisaged improvements in the methods of delivering them, before it will be possible to knock out the industrial power of the United States by a lightning attack.

The threat of strategic bombing, we may conclude, is not an effective way to keep the peace. Opposition to it, then, by individuals and organizations in Europe and America, can do nothing but good. On the military side it will serve to urge on governments a more rational and less provocative policy, such as planning in the event of war to hold essential bases pending the mobilization of resources for reconquest. And, on the moral side, it will substantiate our claim to have remembered some principles which the communists have forgotten. They claim that if the end is good, all means are justified. We, in the West, on the other hand, may come to realize that no good end is likely to result from a means so evil as the threat of strategic bombing.

THE SOCIALIST ISLAND

James R. Newman and Byron S. Miller

The extent to which the development of atomic energy is a threat to the system of private enterprise is debated in the two articles which follow. "The Socialist Island" appeared in the introductory chapter to **The Control of Atomic Energy** (1948), and is reprinted here by the kind permission of the McGraw-Hill Book Company. Both authors were actively associated with the Atomic Energy Act which they describe. Mr. Newman acted as White House Advisor on atomic energy legislation and as Counsel to the Senate Special Committee on Atomic Energy. Mr. Miller was formerly Associate General Counsel of the Office of War Mobilization which acted for the administration in securing atomic energy legislation.

Both the McMahon-Douglas bill and the May-Johnson bill proposed to give the Commission a broad range of powers in controlling atomic energy, the principal difference being that the controls were made specific and predetermined in the former while they would have been wholly up to the Commission in the latter. Nevertheless, on this basic substantive issue there was surprisingly little controversy. On the side habitually defended by exponents of the doctrine of private property and free enterprise there were few voices raised.

And yet the Act cuts more deeply into the area traditionally reserved to private business in our system than any ever passed in time of peace. In fact, it does nothing less than establish in the midst of our privately controlled economy a socialist island with undefined and possibly expanding frontiers. Into a system that was happily being reclaimed for free enterprise in the postwar period the Act deposited a large, portentous, alien, and unassimilable lump. What the outgrowth of interaction between these opposing elements is likely to be Congress did not even discuss. The interaction may generate powerful forces and no ultimate equilibrium is now discernible. It may well be that the existing form of our economic order is no better able to contain atomic energy than is the present international order and that, in fact, the force will produce political changes in the internal arrangements of our society as momentous as those that will almost certainly occur in our external relations. This was certainly not settled by the Act: in fact, though there was an uneasy recognition of its existence; the problem—perhaps for the escapist reasons already mentioned—was never thoroughly debated. We have already indicated some of the elements that explain how such an Act could have been passed at a time when the prevailing temper of Congress and of the country at large was one of extreme impatience with the whole complex of wartime controls of business activity. The basic element was, of course, concern for the national security. Another was the effect of this stupendous power on the public imagination and the general acknowledgment that a force of such unprecedented nature required unprecedented measures to cope with it. Perhaps a third was the inability of business interests to assess quickly the significance to them of measures dealing with atomic energy and to mobilize rapidly behind a defensible position.

Consequently, it was only in connection with the patent provisions, which appeared to strike at one of the principal citadels of private enterprise as it is at present organized in the United States, that any significant opposition was manifested. The patent provisions were, however, for the most part necessary corollaries of the general control provisions, and if it was assumed, even by the implicit consent of silence, that the control system as a whole was necessary, it was difficult to make a convincing case against the patent provisions in isolation.

What, exactly, is the scope of the powers of the Atomic Energy Commission that results in the Atomic Energy Act being described as a legislative enactment without precedent in the peacetime history of the United States? For the purposes of exposition, it will be convenient to think of the control system of the Act as represented by three concentric circles. The innermost circle, fairly definitely formed, is the area of government monopoly; the intermediate circle is the area of direct government controls by means of licensing, the granting of fissionable materials, etc.—an area potentially very great, with elastic boundaries—and the outermost circle comprises the area of indirect controls, including parts of the economy not themselves within the field of atomic energy but likely to be affected by the operations of the Commission in connection with the exercise of its monopoly activities or its control functions.

The Powers of the Commission

The area of monopoly includes the facilities for producing fissionable material—a 3.5-billion-dollar empire that is certain to expand. It has properties in twenty states. Its operations employ thousands of people. The Commission has exclusive ownership of all fissionable material; an entirely new legal substance is created, one that cannot become an object of private ownership. This substance may in time become more important than coal and petroleum combined. Although the point is not certain, the area of monopoly may include all atomic power projects—potentially of a vastness that will make TVA appear minuscule.

Beyond the central area of monopoly extends the intermediate circle of control. The Commission by its licensing power can regulate every single transaction involving source material, every industrial and

commercial application of atomic energy. It can eliminate patent rights where it deems they interfere with effectuation of the purposes of the Act.

Beyond the area of atomic energy proper, its controls cut across a considerable segment of the total economy. It can at its discretion extend licensing control to any substance deemed essential to the production of fissionable material and abrogate patent rights, regardless of their apparent remoteness from the field of atomic energy, if these rights interfere with the utilization of fissionable material or atomic energy.

The policies followed by the Commission in exercising these powers must have a direct and powerful impact on many important aspects of our national life. They will affect not only our military security but our foreign policy, the value of existing capital investments, the structure of industry, and the level of prices and employment—in the end, the structure of society itself.

Limited Government Outmoded?

The powers were conferred by Congress only with profound misgiving and after prolonged heart searching. The Act was passed in the midst of an overpowering nostalgia to return to things as they were, before the disturbances of war and the rude innovations of the New Deal. In passing it Congress implicitly recognized that under the disintegrating force of the atomic bomb the ancient institutional forms, honored and familiar though they were, had become obsolescent. For it is apparent that in the atomic age, in times of international unbalance, there is no limit to what the state will have to do in the name of security. There is disagreement among scientists as to just when the world will be technologically prepared for the war of push buttons that will make possible the instantaneous destruction of dozens of cities and millions of people; but apparently the only question is how long it will be before this scientific triumph becomes possible. The tacit recognition of this fact underlies the whole Act and was so generally understood that there was never even a discussion of the Constitutional power under which this great program was to be carried forward. It was taken for granted that the Atomic Energy Act would be validated under the same complex of Constitutional powers that had enabled the government to conduct the gigantic war just completed—the power to raise and support an army and navy, to declare war, and to undertake such functions as are necessary and proper to the effectuation of these purposes. With a few minor exceptions—such as the construction of the dams ultimately included in the TVA project—these powers in the past have been invoked only in actual time of war or after the declaration of a national emergency. The Atomic Energy Act was passed, however, when the country was at peace a few months after a great war had been victoriously ended and when there was no specific danger on the international horizon.

This is ominous doctrine, although there can be little doubt of its acceptance by the courts. What it means is that in the new age just beginning the war powers of the Constitution will be illimitable in time of peace as they are in time of war. We have already commented on the implications of this doctrine as it affects limitations on the government in the interest of safeguarding individual freedom. The comments can be extended. There is no escaping the logic of the conclusion that, given the terrible possibilities of total national destruction, no definable bounds can be set to the war powers even in times of nominal peace and the Constitutional doctrine of limited government and specifically delegated powers must become outmoded.

International Security or the Military State?

We have not yet faced the fact altogether clearly, but the choice that lies before us is between a genuinely working international order and the total military state kept always in a condition of total preparedness. When Congress voted the Atomic Energy Act, in effect it announced the end of the institution of the sovereign national state based on the system of capitalistic free enterprise. If we are to keep a system of capitalistic free enterprise, we must have conditions of genuine peace and security, which permit men to go about the business of concentrating on a profit without fear of instant death; and it is apparent that this end can be achieved only by the surrender by the state of certain powers hitherto deemed indispensable adjuncts of sovereignty. If, on the other hand, we are determined to keep the sovereign nation-state, we will have to surrender to the state personal and economic freedoms we have traditionally enjoyed; we will have to renounce a largely uncontrolled and self-regulating economic system; we will have to gear the whole of our social institutions to the end of national security, establishing the great bureaucracy and the bewildering complex of governmental controls that experience has shown to be necessary for this purpose. There will have to be other laws to follow the Atomic Energy Act—an act establishing a great program of stand-by plants ready to convert instantaneously to war production; an act providing for a huge permanent military establishment, fully armed and continually alerted; and, as conditions deteriorate, an act undertaking deconcentration of our industrial plant and our huge urban centers. The demands of security will be implacable and illimitable.

The issue remains open and at present the country wavers between the poles of international security and the military state. It is entirely possible that it will be several years before the outcome is determined.

Challenge of Undefined Power

In the meantime, the Commission undoubtedly feels the effect of the opposing tendencies. It has this enormous complex of power to exercise; it has to operate in a situation tense, confused, and ill-defined; it is administering an institution conceived on lines currently repugnant to a large part of the population of the country; and to guide it, it has only the most general of policy statements:

"It is hereby declared to be the policy of the people of the United States that, subject at all times to the paramount objective of assuring the common defense and security, the development and utilization of atomic energy shall, so far as practicable, be directed toward improving the public welfare, increasing the

standard of living, strengthening free competition in private enterprise, and promoting world peace."

The practical application of these standards is a test of wisdom and statesmanship such as no other administrative agency has ever been called upon to meet. The field in which the Commission operates is well populated with sensitive and highly vocal private interests; its actions will affect property rights and expectations of profit. There is no steady magnetic pull pointing policy unerringly to the lodestar of the national interest, and disturbances in the magnetic field caused by the filings of private interests will be acute and constant. Under these circumstances, the role of the Commission can be no more firmly fixed than that of the Supreme Court when it began the task of interpreting the Constitution.

The framework for its operations is spacious and, to a considerable degree, plastic. The objectives of policy given it for guidance are inclusive enough to justify almost any course the Commission sees fit to steer. It is true that the factors that must ultimately determine its orientation lie largely outside its control—in the arena of international politics and in the mysterious interstices of the public mind. Nonetheless, its powers for good or for ill are enormous. It has been granted unprecedented authority to perform a task of historic importance, and its responsibilities are as grave as its opportunities are great. Whether the world will choose the incalculably difficult path to an effective international order or in frustration and despair sink into the slough of warlike preparations in which no civilized life is possible is, of course, an issue upon which the Commission can have little direct effect. But it can steadfastly resist any drift toward despair or any sudden wave of hysteria; it can demonstrate the public benefits that can be made to flow from purposive public planning of a great national resource; and it can show that such planning need not be incompatible with the preservation of individual liberties. It can, by the exercise of its unprecedented powers, accelerate the development of peacetime applications of atomic energy and thus afford practical evidence of the enormous constructive potentialities of this newly won force when devoted to the service of man.

DOES CONTROL OF ATOMIC ENERGY INVOLVE A CONTROLLED ECONOMY?

A. P. Lerner

Dr. Lerner, Professor of Economics at Roosevelt College, offers a criticism of the arguments presented by Mr. Newman and Mr. Miller in the foregoing article.

One of the most striking things about the popular discussion of atomic fission has been the degree to which all of its effects have been exaggerated. It is naturally somewhat more difficult to exaggerate the importance of its most important effect, the atom bomb, in comparison with which all the other effects are quite negligible, but even the importance of the atom bomb has been exaggerated.

Newman and Miller in their book *The Control of Atomic Energy* spend a chapter in discussing the importance of atomic energy for our social-economic order. The chapter is called "The Socialist Island" and argues that in the absence of a successful world government, the exercise of governmental control over atomic energy, made necessary by considerations of military security, may bring a rapid end to private capitalist enterprise.

Two quite separate arguments are adduced for the conclusion that atomic energy is dangerous for capitalism. One is that the Atomic Energy Commission would form a very large socialist island which the capitalist environment would be unable to assimilate and would apparently therefore have to be assimilated by it. The other is that in the absence of the successful establishment of a world government more and more of the national resources would be devoted to armaments. The distinction between peace and war would evaporate as the cold war got warmer and warmer and the extension of war powers would put more and more of the economy under governmental control leaving very little for private enterprise.

Neither of these arguments is satisfactory. In the first place there is no reason for supposing that public and private enterprise cannot exist side by side—that they must inevitably digest each other. The idea that public and private enterprise are somehow unable to live together seems to have no basis other than the enthusiasm of extremists for either of the two forms of enterprise. They have existed together in all conceivable proportions and there was never any automatic assimilation or absorptions of one by the other. It is nothing but an interesting but inapplicable biological analogy.

In capitalist societies the public sector, large as it may be, seems to live in a kind of shadow. Once accepted, it becomes invisible. Chesterton once wrote about a postman who committed a murder and took the body away in his small sack under the nose of the police. He was a kind of invisible man. The same is true of the postoffice and the many other large public enterprises that continue to operate silently even while more rabid enthusiasts for capitalism declare that public enterprise is inefficient, fatal to civil liberties and destructive of the modern economy. Of course the more rabid collectivists share with them the dogma of immiscibility and are supported in their propaganda by a very fine phrase. An economy in which both private and public enterprise coexists, which some have rather unfelicitously called the Mixed Economy, is called by the collectivist purists "The Mixed Up Economy." But there is little logic behind this mischievous rhetoric. It is effective only as long as one accepts the implicit and baseless dogma of immiscibility instead of observing that private and public enterprise have mixed and do mix. The reasonable approach is to forget all about

economic "purity". It has no more to add to the good society than dogmas about racial "purity."

The second argument, that the intensification of military preparedness would limit the area of private enterprise is not satisfactory because what must be limited is the production and distribution of non-military goods and services, not the area of the economy that remains under private enterprise. It is perfectly possible, as indeed was the case very generally in the last war, for the military to get all its needs from private enterprise. The orders are indeed not given by private individuals but by the government for the military, but as long as the customer pays, private enterprise does not ask many questions. And the shift from civilian to military production, which is of course necessitated by an armaments race, would also take place in a completely socialized economy.

Fissionable material must be under governmental control for obvious military reasons. But it is perfectly possible for large parts of the work of the Atomic Energy Commission to be done for the commission by private corporations or even individuals on contract. This could very well augment rather than diminish the total volume of private enterprise in the economy. And this is quite apart from other indirect helps to private enterprise such as the availability of cheap electric power in many parts of the country. Just like the TVA, atomic energy, governmentally controlled or not, increases the productivity of the economy as a whole and private enterprise can share in the gain. There would seem here to be a confusion between producing military goods instead of peacetime goods and producing by public enterprise instead of by the techniques of private enterprise. The two shifts are very largely independent of each other.

The development of public enterprise and of public planning is socially desirable wherever it serves the public interest better than does the alternative of private enterprise and its responses to the needs of citizens through the mechanism of the market. And conversely it would be desirable to give up a public enterprise as well as any elements of public planning wherever private enterprise and the responses of the market would be better servants of the citizens. Democracy is desirable in any case and must be safeguarded by public vigilance in any case. This approach to the issue of private or public enterprise, judging each in every case according to which functions best in the general social interest, and keeping an overall priority for the maintenance of democracy, is called Democratic Functionalism. And as more and more people discover the dogmas of purity to be unfounded, the approach of Democratic Functionalism will more generally and more consciously become the guide to political and economic policy in the general interest in democratic countries.

The problems of public and private enterprise, of democracy and dictatorship and even of peace and war are substantially where they were before the advent of nuclear fission. Even the atom bomb has only given a special emphasis to the truism that the race is on between civilization and war to decide which will destroy the other. The atom bomb has merely shortened the track.

As to the danger of atomic energy for capitalism, that is merely another of the imaginary or negligible effects which we are always tempted to turn to and to exaggerate in keeping our minds off the main problem. There is no more reason for supposing atomic energy more fatal to sovereign capitalist states than to sovereign socialist states. What atomic energy has made somewhat more obsolete is not capitalism but national sovereignty. It is not public enterprise or private enterprise or capitalism or socialism—it is the sovereign state that stands between us and world order and security.

WFUNA Calls For Immediate Disarmament

The Political Commission of the World Federation of United Nations Associations (WFUNA) meeting in Geneva, September 13-18, under the chairmanship of Colonel Charles Marburg, of the United States Association, debated and finally unanimously passed the following resolution relative to atomic energy. The resolution was based on one which had been proposed by the United States Association:

RESOLUTION No. 2
ATOMIC ENERGY

WFUNA notes with deep anxiety the present suspension of the activities of the AEC;

RECOGNIZES the importance of finding a basis for fruitful resumption of the Commission's labors; and therefore

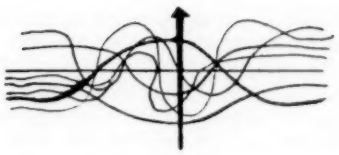
RECALLS its resolution of August 1947 as follows:

"That a general agreement should be adopted immediately outlawing the use by all nations of atomic and bacteriological arms and similar means of mass destruction; and that at the same time there should be established a system of an international inspection and supervision sufficiently comprehensive to make possible the destruction of existing arms or their surrender to an international body."

WFUNA ADDS that international security, and the creation of an international police force, will be fatally prejudiced unless progress is made in the field of Disarmament. Such Disarmament must include measures to stop the fateful race for supremacy in atomic killing power, and must eliminate from national armories all weapons of mass destruction; and these measures must include effective provision for continuous international supervision, in order to ensure that atomic energy shall only be used for pacific purposes.

This resolution was then unanimously adopted in the plenary session of WFUNA. The resolution of August, 1947, was also derived from one proposed by the United States Association.

OUGHT SCIENCE TO BE PLANNED? TWO OPPOSING VIEWS



The following debate on the organization of science was broadcast over the Home Program of the BBC in September. Professor J. D. Bernal, who presents the case for planned research, is University Professor of Physics at Birkbeck College, London. The arguments for individualism are given by Professor Michael Polanyi, formerly Professor of Physical Chemistry and now Professor of Economics at the University of Manchester.

The Case for Collective Research

J. D. Bernal

Science has already become an indispensable condition for the very existence of civilized society; it is rapidly becoming the major factor in determining the direction of progress. The question of its internal organization and its links with the other social organs is no longer one for scientists alone, but should be of concern to all.

There are in Britain some 50,000 trained scientists. Of these the great majority are occupied either in teaching or in maintaining the scientific controls absolutely necessary for the day-to-day running of industry and public services. Some 15,000 are concerned with the development of new machinery and processes, leaving about 5,000 research workers to provide for the advance of science itself. In other industrial countries similar numbers are employed. There must be throughout the world some 250,000 scientific workers and some 25,000 research workers. The existence of such numbers implies organization, and, in fact, science is already organized on a very extensive scale.

Science is Now Organized for War and Private Profit

What is the purpose of this organization today? The figures of national expenditure on research show clearly enough. Of the odd £100,000,000 a year that are spent on research and development in Great Britain, over £60,000,000 goes to military research, £30,000,000 to private industry and only £10,000,000 to civil research, including £3,000,000 for all university research. These figures speak for themselves. Science is at present organized primarily for war and private profit.

These are not the purposes for which the scientific workers themselves want science to be organized. They want to be free to use their knowledge, in industry and agriculture, in medicine and social science, for peace and not for war, for the benefit of all and not the profit of a few. To secure this we need an organization of science of a new kind: one which sets itself definite ends and considers the most effective means for achieving them. Quite apart from the size of science, the increasing complexity and interdependence of its different parts—the use, for instance, of nuclear fission to produce tools for biochemical research—show that the whole system needs to be linked together so that every section can profit as soon as possible from the results of any of the others. We can no longer, as we could in past ages, leave the organization of science to chance or to the personal relations of individual scientists.

It does not, of course, follow that any kind of organization would be appropriate for science. The mere task of finding the kind of organization needed for science is itself a scientific problem. For science differs from all other human enterprises by dealing, not with the known and the regular, but with the unknown and unexpected. But the problem of organization is not insoluble, and the first steps to solve it have already been taken. The experience of the war showed that when the purpose was clear the organization followed fairly naturally, and its main principles are coming to be more clearly recognized. There are five of these: strategy, teamwork, flexibility, freedom of communication, and respect for the individual.

Five Principles Must Guide the Organization of Science

The first principle is that science must have a strategy: objectives must be considered and the available forces distributed between them. That does not mean a dragooning of science. It only means that it is the responsibility of scientists themselves to consider collectively where they are going and to act accordingly. The Royal Society did in fact do this towards the end of the war in reporting in detail on the needs of fundamental science. Neither does it mean, if our objective is human welfare, that no science that does not immediately conduce to it should be undertaken. To have a strategy for research means precisely the opposite. Every immediate practical application of science depends on the past and present activity of scientific workers concerned with completely different aspects of natural phenomena—what used to be called the pure and are now called the fundamental sciences, such as physics and biology. Indeed, in considering the over-all balance of science, it is becoming clear that more and not less support, absolutely and relatively, must be given to fundamental science.

The second principle of organization is teamwork, each member of the team contributing both his own special knowledge and his own individual intelligence to a collective work. Science grows continually in range and complexity. What any individual can learn is absolutely limited. Close personal association is therefore a growing necessity in science.

The third principle is flexibility. In science it is impossible to lay down lines of progress in advance. Therefore, the organization of science has to be adjusted to rapid changes of emphasis: to the revaluation of previous knowledge in the light of new

discovery and to the working out of its implications in all related fields.

The fourth principle is freedom of communication. This means more than the absence of the restriction of military and industrial secrecy which are already threatening to choke the progress of science. The increasing scale and complexity of science require a rapid and extensive positive communication service which will keep every worker informed with the least delay of everything that should be of interest to him, while not overburdening him, as at present, with irrelevant material.

The fifth principle is respect for individuality; the actual process of discovery is always achieved in an individual mind, though it often happens that many individual minds reach the same answer at about the same time. The conditions of organization must be such as to protect and cherish individual activity, however wayward it may be. This is in no contradiction with the idea of teamwork. Experience shows that individuals become greater as people as well as scientists when working together; that the solitary worker may become a hindrance even to himself.

Democratic Organization Will Preserve Freedom

Many people have said, and will continue to say, that it is impossible to reconcile these principles. In fact there is a means to reconcile them, but it has yet to be used to full effect —democracy: the integral democracy of science itself. Science needs to be run on all levels, from the research group and the laboratory to the general organization of the whole of science, by scientific workers themselves and not, as at present, largely by a mixture of administrative officials and senior scientists. What is needed is the judicious combination of the wide experience of the old and the immediate and active contact with practice of the young working scientists.

The democracy of science can only be effective, however, if those who participate in it have a deep sense of social responsibility and a knowledge of tradition to add to their technical competence. There are those who are blind to this and oppose all organization of science on principle and are even more strongly opposed to its organization in the service of a planned achievement of human welfare. They do this in the name of the "freedom of science" and of its intrinsic purity. They cannot, or will not, conceive of organization as other than that of the army or civil service, one of subordination and routine. Then, having paraded this bogey, they accuse those who wish to organize science, quite regardless of their statements or practices, with plotting to impose by force this type of organization on science, and libel them with their favorite catchwords as dictators and totalitarians. Having thus disposed of them, they put forward the ideal of pure science undertaken for its own sake, as if this was in some sense in contradiction to science undertaken for a social purpose.

Pure Science Is a Useless Abstraction

No one denies that in the actual carrying out of scientific work the intrinsic interest of the problem is paramount, whether it be making an atomic bomb, curing a disease, or establishing a theorem about prime numbers. The contemplation of the hidden beauties of nature and of man's ingenuity in discovering them are fine and noble pleasures. But immediate enjoyment of an activity is in no contradiction to its having an ultimate purpose which goes beyond it. We like eating for its own sake; nevertheless, we eat to keep alive, and anyone who puts eating for its own sake as the sole objective for eating we call a glutton, or at best an epicure. In fact the whole history of science shows that connection with practice is the very lifeblood of scientific advance.

Man is continually transforming his environment by his labor. The progress of industry from the Stone Age till today is nothing but a record of its transformation. By transforming it, and only by transforming it, does he know how it works. But once having learned how it works, he can now go back and transform it ever more effectively. Pure science is a useless and unworkable abstraction. To find out most rapidly and effectively how the universe came to be and how it works needs a complete integration of science with every human enterprise, technical and social. Many of those who oppose organization of science do not really want to find out most effectively and rapidly about the universe and how to run it: they want to be able to find out about nature in their own time and in their own way, and they do not mind how difficult and muddled they make the task for themselves or others. In fact, that is what makes it a better game.

As an attitude of serious men in a modern world threatened with war and starvation this is sheer irresponsibility. And it is worse, it is reactionary and obscurantist. In fact such people do not wish for the freedom of science: they only want to secure a little select place for themselves and let the rest go to the devil. They do nothing to prevent the wicked misuse of science for war; they do not complain that thousands of scientists capable of original thought waste their time and talents in competitive and secret research; they do not even take any trouble to ensure the flourishing of the pure research that they so much praise. Nearly all the efforts to keep fundamental science properly financed and to see to the training of an adequate number of scientists for this purpose have come from those who believe in the organization of science. In fact the freedom of science is as much a smoke screen for the use of science for profit and war as is freedom in economics for the activities of the monopolists.

The effective guarantees of the freedom of science are its internal democracy and its active connection with the popular forces outside science. Its defenders are those active scientific workers who have seen what democratic organization can do for science and will not rest until it is fully used for human welfare. This feeling has inspired the organization of the scientists themselves. Here we have what is effectively a new profession equivalent to those of law and medicine, and with as deep a sense of its social responsibility.

Science Has No Frontiers

It was this sense that led to the formation over thirty years ago of the Association of Scientific Workers which now contains in its 20,000 members a large proportion of the active and socially conscious scientists in the country. They have realized that the status of the scientist will not be and will not deserve to be a high one unless science is organized effectively for human welfare and, conversely, that the organization of science implies conditions for individual scientific workers which will ensure that they can carry out their work freely and effectively, and with due social recognition.

Some years ago the Association of Scientific Workers joined the Trades Union Congress, realizing that the scientist was not a different order of being from the manual and clerical worker and that, in fact, the future of science will depend on the degree in which productive activity in field, factory, and laboratory can work as one unit. If scientists try to become a closed caste and imagine because of their technical knowledge that they should have a leading part in the control of affairs, they will destroy the tradition of science and become effectively the tools of reactionary interests.

Science has no frontiers; it is as important to organize science and scientists internationally as it is nationally. Recent years have seen great advances in both of these aspects: international scientific unions in many fields of science fathered by Unesco have been strengthened and extended, and eighteen national associations of scientific workers are now joined in the World Federation of Scientific Workers. The tasks of science in the world as a whole are of the utmost urgency. Most of the people in the world today are half-starved and diseased; this is a legacy of the ignorance and folly that has lasted far beyond its time because science has been almost entirely concentrated in a few wealthy industrial countries. It needs to be spread, not as an export, but as a natural growth in every country, utilizing to the full latent talents which are to be found in every people.

This unbalance of productivity between these countries which have begun to use science and those which have yet to do so is the major underlying cause of war today. The prevention of war and the raising of the general standard of welfare and productivity throughout the world are the great tasks of our time. They are political tasks in that the drive for their achievement must come from the people themselves, but one essential condition for their success is the organization of science.

The Case for Individualism

Michael Polanyi

This age of ours has had its great revolutionary movements, but it also staged some strange wild goose chases. About ten years ago there suddenly arose in Britain a movement for the planning of science. A number of books appeared which expounded the Marxian theory that scientific discoveries are made in response to social needs. This function of science, we are told, had been recognized in Russia and had now been embodied there in the nation-wide planning of all scientific research by a single authority. The Soviet Academy of Science undertook to allocate annually to the scientific institutions of the country the problems which required investigation, and each institution then worked out its own detailed plan for the whole year, and assigned a target to each individual scientist. This was the model set up for imitation by Marxian scientists in Britain. They urged that science would gain new strength in this way and, above all, would return to its true mission, which was to serve the needs of the whole people.

The books which spread this new doctrine became best-sellers and they attracted a great number of followers. Their forces foregathered in a new section of the British Association founded in 1938. The movement penetrated widely into masses of scientifically trained people through the Association of Scientific Workers, which expanded under this impetus to a membership of over 15,000. In January, 1943, the Association held a crowded conference in London, which was presided over by Sir Robert Watson Watt, and filled the Caxton Hall to overflowing. Sponsors and speakers included some of the most eminent scientists in Britain. It was taken for granted from the start that all scientific work must be integrated under the guidance of planning boards on the model of those established in wartime. Speaker after speaker condemned in angry and sweeping terms the traditional modes of conducting scientific activities, and a detailed description of Russian planning went uncriticized. Professor Bernal himself declared that in the wartime organization of science "we had learned for the first time how to carry on scientific work rapidly and effectively."

No opposing voices were heard at the conference, and anti-planners were castigated as people agitating for anarchy and ignorance. It really seemed that in Britain the movement for the planning of science was rushing forward irresistibly to victory. And yet today one can hardly remember what it was all about. The central planning of science is almost forgotten. The books which started the movement for planning are still read, but their message is no longer taken seriously. The movement has passed away leaving hardly a trace. If you compare, for example, the postwar development of scientific organization in Britain with that of America, where there has never been a planning movement, there is no difference that could be ascribed to the movement for planning. In the universities of both countries scientific research continues substantially on traditional lines.

The whole curious interlude could, in fact, be now forgotten and left for the future historian to ponder on, but for two vital reasons: First, there is the fact that our fellow-scientists in Russia have still to submit to regimentation by planning, or at least have to waste their time and surrender the dignity of their calling by pretending to submit to it. Worse still, they remain constantly in danger of falling victim to the machinations of political careerists: men who gain influence in science by pretending to be the fulfillers of Marxism and who may at any moment direct against their fellow-scientists the deadly shafts of Marxian suspicion and Marxian invective. The fate of Vavilov and of his many collaborators who succumbed to the "planning of science" as exercised by Lysenko, can never be absent from the thoughts of any Russian scientist. It falls to us to fight the false and oppressive doctrine forced upon our Russian colleagues, which, even while they are bitterly suffering under it, they are compelled to support in public.

And then, though the movement for the planning of science has been without effect in Britain, it remains no less a disturbing symptom of the instability of our days. It should remind us that in this present revolutionary period no great institution can take its own continued acceptance for granted, for even the most ancient and well-founded claims are at such times in danger of going by default if left undefended. Before the controversy over the planning of science, there had been little attempt made to examine closely either the principles by which scientific progress is achieved, or the policies which have customarily guided the organization of science. Now that we have had our warning, we must clearly recog-

nize where we stand in these matters. Henceforth we must be able to declare explicitly what our fundamental principles are and to vindicate them in the face of new problems and new hostile doctrines.

Structure of Scientific Knowledge Favors Individualism

The traditional claim that scientific research can be effectively pursued only by independent scientists can be traced back to the earliest statement of freedom of thought by Milton in his *Areopagitica*. Yet the belief that science can prosper only in freedom may seem to conflict with the accepted definition of science as systematic knowledge. How can a structure, which claims to be systematic, prosper from additions made by individuals without any central guidance? Suppose we started building a house without any plans, each workman adding his part according to his own ideas, using whatever materials he preferred, putting in bricks or timber, lead pipes or floor boards as he thought fit. Surely the result would be a hopeless confusion.

If science really does prosper by allowing each scientist to follow his own bent, the systematic structure of science must differ fundamentally from that which underlies the structure of a house. And this is quite true. The nature of scientific systems is more akin to the ordered arrangement of living cells which constitute a polycellular organism. The progress of science through the individual efforts of independent scientists is comparable in many ways to the growth of a higher organism from a single microscopic germ cell. Throughout the process of embryonic development each cell pursues its own life, and yet each so adjusts its growth to that of its neighbors that a harmonious structure of the aggregate emerges. This is exactly how scientists cooperate: by continually adjusting their line of research to the results achieved up to date by their fellow-scientists.

However, just as science cannot be planned by men as they plan a house, neither do scientists form part of science in the way that cells form part of an organism. The actual situation, which lies somewhere between the two, may perhaps be better pictured by using Milton's simile, which likens truth to a shattered statue, with fragments lying widely scattered and hidden in many places. Each scientist on his own initiative pursues independently the task of finding one fragment of the statue and fitting it to those collected by others. This explains well enough the manner in which free scientists jointly pursue a single systematic purpose.

But there is another feature of science which is of great importance for its correct organization and does not fit in so readily with this picture. The progressive stages of scientific knowledge have a deceptive completeness which makes them resemble the developing shapes of a growing organism, rather than the mutilated forms of an incomplete statue. If we pieced together a statue and there was no head to it, we should feel sure that it was yet incomplete. But science in its progress does not appear obviously incomplete even though large parts of it may still be missing. Physics as it stood half a century ago, though lacking quantum theory and relativity, and ignorant of electrons and radioactivity, was yet thought at the time to be essentially complete; and not only by laymen, but also by the scientific authorities of the time. To illustrate the growth of science we must imagine a statue which, while it is being pieced together, appears complete at every successive stage. And we may add that it would also appear to change its meaning on the addition of every successive fragment — to the great and ever renewed surprise of the bystanders.

Progress in Science Cannot Be Forecasted

And here indeed emerges the decisive reason for individualism in the cultivation of science. No committee of scientists, however distinguished, could forecast the further progress of science except for the routine extensions of the existing system. No important scientific advance could ever be foretold by such a committee. The problems allocated by it would therefore be of no real scientific value. They would either be devoid of originality, or if, throwing prudence to the winds, the committee once ventured on some really novel proposals, their suggestions would invariably prove impracticable. For the points at which the existing system of science can be effectively amended reveal themselves only to the individual investigator. And even he can discover only through a lifelong concentration on one particular aspect of science a small number of practicable and really worthwhile problems.

Scientists Must Be Independent

The pursuit of science can be organized, therefore, in no other manner than by granting complete independence to all mature scientists. They will then distribute themselves over the whole field of possible discoveries, each applying his own ability to the task that appears most profitable to him. Thus, as many trails as possible will be covered, and science will penetrate most rapidly in every direction toward that kind of hidden knowledge which is unsuspected by all but its discoverer, the kind of new knowledge on which the progress of science truly depends. The function of public authorities is not to plan research, but only to provide opportunities for its pursuit. All that they have to do is to provide facilities for every good scientist to follow his own interests in science. To do less is to neglect the progress of science; to do more is to waste public money. Such principles have in fact essentially guided all well-conducted universities throughout the modern age.

Apart from opportunities for research, there must be facilities for the publication of new discoveries; or, more precisely, of all claims to new discoveries. That involves a problem. We must guard against cranks and frauds, and also keep out ordinary blunderers, if scientific journals are not to spread confusion. Yet the work of pioneers, which at first sight may look unsound and sometimes even crazy, must not be excluded. Similar problems have to be met in the selection of personnel for scientific appointments and in the allocation of funds. Herein lies the vital control of scientific life. The responsibility for operating it rests, ultimately, with organized scientific opinion. It has to act as policeman the year round and yet ever remain on the alert, to offer its help to the true revolutionary—the creative breaker of the law. To guard scientific standards, while assuring full scope to new heterodox talent, is the function of scientific opinion. For this it needs humility in the service of science. But it must also take pride in that which it serves and demand respect for it everywhere. For science is not the don's fad or the student's grind, but a way of understanding nature, equally needful for every man.

NATIONAL SCIENCE FOUNDATION PROPOSALS BACKGROUND AND COMMENTARY

Reuben Frodin

Mr. Frodin, a University of Chicago lawyer and administrator, reviews the complicated history of science legislation in the 80th Congress and comments on unresolved points of conflict. The essential features of the Senate bill (S. 2385) for a National Science Foundation are presented in digest form.

The *Bulletin* has presented numerous discussions of the legislative proposals for a National Science Foundation in the past three years. Yet, the complexity of this recent history and the fact that the essential conflicts about continuing federal aid to science research have yet to be resolved suggest that it may be useful briefly to review events of the 80th Congress as background in approaching the legislative situation in the 81st.

In the *Bulletin* for November, 1946, Talcott Parsons of Harvard reviewed the history of the Magnuson and Kilgore bills introduced in the 79th Congress. The Magnuson bill (S. 1285) reflected the views of those who wanted the Foundation to be largely self-governing and independent, and the Kilgore bill (S. 1297) followed more closely the views of the Administration in making the Foundation an integral part of the executive branch of the government.

80th Congress Activity

A compromise bill (S. 1850) passed the Senate on July 19, 1946, but died in a House committee. The 80th Congress passed S. 526, a re-working of the Magnuson bill by Senator Smith of New Jersey and others. As the bill came from the Committee on Labor and Public Welfare, it provided that the Foundation be administered by a board of twenty-four members appointed by the President from names presented by educational and scientific organizations. The power of appointing the Director was to rest with the Foundation. The bill also set up divisions similar to those contained in the Magnuson bill: medical research; mathematical, physical and engineering sciences; biological sciences; national defense; and scientific personnel and education. The Foundation could establish new divisions as it deemed necessary, leaving open the question of research in the social sciences. The patent policy, too, was left open; the Foundation might dispose of inventions in any manner "calculated to protect the public interest and the equities of the individual or organization" involved, within the limits of the existing patent laws.

S. 526 passed the Senate on May 20, 1947, with two important amendments: one concerned the distribution of funds; and the other provided that the Director be appointed by the President instead of by the Foundation. In July the House passed H.R. 4102, a committee bill sponsored by Rep. Wolverton (N. J.), then vacated the proceedings, and passed S. 526 with amendments which made it unacceptable to the Senate. Agreement was reached in joint conference on the House version (which provided that the Director be appointed by the Foundation), and the bill was repassed in both houses and sent to the President.

President Truman withheld his approval of S. 526. In his "Memorandum of Disapproval"[1] dated August 6, 1947, he expressed his deep regret at being forced to take this course, and repeated his endorsement of the idea of a science foundation. He criticized the setup provided by the bill, however, as "a marked departure from sound principles" of administration. He stated:

Full governmental authority and responsibility would be placed in twenty-four part-time officers whom the President could not effectively hold responsible for proper administration. Neither could the Director be held responsible by the President, for he would be the appointee of the Foundation. . . . In the case of the divisions and special commissions, the lack of accountability would be even more aggravated. The members of the Foundation would be authorized to appoint the full-time administrative head of an important agency in the executive branch of the Government, as well as more than seventy additional part-time officials in whom important governmental powers would be vested. This represents a substantial denial of the President's appointing power. . . .

The President then went on to predict that, because of inevitable associations between the part-time members of the Foundation and institutions eligible for contracts or grants, suspicions of favoritism would arise. It would be more advisable, he insisted, to give responsibility to full-time government employees, and retain eminent scientists in a part-time advisory capacity.

The Steelman Report

Shortly after this veto, the President's Scientific Research Board, under the chairmanship of John R. Steelman, published its report, *Science and Public Policy* (August 27, 1947). The Board recommended that a National Science Foundation should be created within the Executive Office of the President, headed by a Director appointed by the President, and assisted by a part-time advisory board, half of whose members would be government personnel.

The Foundation would be authorized to support basic research with funds ranging from $50,000,000 in the first year to $250,000,000 in the tenth. Part of the funds would be granted by government scientific agencies themselves. It was suggested that the work of the board should be related to the over-all program of federal aid for higher education, and should include among its objects the improvement of standards in weaker institutions. The report also said:

In former versions of the Science Foundation legislation, the Foundation would have been given power to make scholarship and graduate fellowship grants to science students. Such aids may well be essential in the future . . . but there are few if any problems here which are uniquely or especially significant to the biological and physical sciences. Sound policy in this connection will encompass a broader view of higher education generally (III, 26).

1. Summarized in *Bulletin* III (October, 1947), 290. See also the excellent article of Don K. Price, "The Deficiencies of the National Science Foundation Bill," *ibid.*, 291.

In the second session of the 80th Congress, two bills, S. 2385 (by Senator Smith and others) and H.R. 6007 (by Representative Wolverton), were introduced as companion bills on March 25, 1948. Smith and Wolverton had been responsible for S. 526 and H.R. 4102, respectively, in the preceding Congress. On April 20, S. 2385 was reported out of the Senate Committee on Labor and Public Welfare with certain amendments, the most important of which was the abolition of the executive committee which had specific important powers. On May 5 the Senate passed S. 2385 as amended. On June 1 and 2 the House committee held hearings on both S. 2385 and H.R. 6007, slightly amending H.R. 6007 to clarify certain provisions and to delineate further the powers and duties of the members of the Foundation and of the Director, who would be the full-time executive officer of the Foundation. On June 4 the amended H.R. 6007 was reported to the House, but no further action was taken before adjournment.

Because these two bills represent the greatest degree of consensus achieved by Congress after President Truman's veto, and as they will presumably form the point of departure for further discussion, the essential features of S. 2385 are here presented:

DIGEST OF S. 2385

SECTION 2 establishes the National Science Foundation in the executive branch as an independent agency.

SECTION 3. *Membership.* (*a*) provides that the Foundation shall consist of 24 members, appointed by the President by and with the advice and consent of the Senate. Members must be persons eminent in the fields of science, engineering, education, or public affairs, selected solely on the basis of established records of distinguished service. The President is requested to give due consideration to recommendations from scientific or educational organizations. (*b*) provides that the term of each member shall be 6 years, with terms staggered. A member for 12 consecutive years shall be ineligible for re-appointment for 2 years.

SECTION 4. *Powers and duties.* (*a*) "The Foundation is authorized and directed: (1) to develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences; (2) to initiate and support basic scientific research in the mathematical, physical, medical, biological, engineering, and other sciences, by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such basic scientific research and to appraise the impact of research upon industrial development and upon the general welfare; (3) after consultation with the Secretary of Defense, to initiate and support scientific research in connection with matters relating to the national defense by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such scientific research; (4) to grant scholarships and graduate fellowships in the mathematical, physical, medical, biological, engineering, and other sciences; (5) to foster the interchange of scientific information among scientists in the United States and foreign countries; (6) to correlate the Foundation's scientific research programs with those undertaken by individuals and by public and private research groups; and (7) to establish such special commissions as the Foundation may from time to time deem necessary for purposes of this Act."

(*b*) states that "it shall be the objective of the Foundation to achieve the results of scientific research in the most efficient manner possible and to strengthen basic research and education in the sciences, including independent research by individuals, throughout the United States, including its territories and possessions, and to avoid undue concentration of such research and education." (*c*) The Foundation is to meet at least once a year. (*e*) "The Foundation is authorized to appoint from among its members, or otherwise, such other committees as it deems necessary and to assign to such Executive Committee or other committees such powers and functions as it deems appropriate for the purposes of this Act." (*f*) calls for annual report to President for submission to Congress.

[Section 5 of the House bill, providing for executive committee with the essential powers of the Foundation, was stricken from Senate bill in committee before passage. See (*e*) above.]

SECTION 5. *Director.* The Director of the Foundation is to be appointed by the President by and with the consent of the Senate. The Director is to serve as (1) an ex-officio member of the Foundation, and (2) the chief executive officer. Salary $15,000 per annum; term 6 years, unless sooner removed by the President.

SECTION 6. *Divisions.* (*a*) provides that unless otherwise provided by the Foundation, there shall be within the Foundation divisions of medical research; mathematical, physical, and engineering sciences; biological sciences; and scientific personnel and education. (*b*) provides that other divisions may from time to time be established.

SECTION 7. *Divisional committees.* (*a*) provides that there shall be a committee for each division. (*b*) provides that each committee shall be appointed by the Foundation and shall consist of not less than 5 persons who may be members or nonmembers of the Foundation. (*c*) and (*d*) relate to terms (2 years) of members of committees, to election of chairmen, to rules of procedure, and to duty to make recommendations to, and to advise and consult with, Foundation and Director.

SECTION 8. *Special commissions.* Shall consist of 11 members appointed by the Foundation; 6 eminent scientists and 5 others. Each commission is to make a survey of public and private research being carried on in its field, and to recommend an over-all program.

SECTION 9. *Scholarships and graduate fellowships; register of scientific personnel.* (*a*) authorizes Director, with approval of Foundation, to award scholarships and graduate fellowships for scientific study at accredited nonprofit American or foreign institutions selected by recipient. Selections are to be made from among citizens solely on basis of ability. In choosing between applicants of equal ability, scholarships and fellowships are "to be awarded in such manner as will tend to result in" wide geographical distribution. (*b*) directs the Foundation to maintain register of scientific and technical personnel, and in other ways to provide a clearing-house for information. (By SECTION 14 (*j*) the National Roster is transferred from the Department of Labor.)

SECTION 10. *Authority of Foundation.* Empowers Foundation to do things necessary to carry out act. Contains exemptions from certain laws. (*c*) authorizes contracts without legal consideration, bonds, or advertising for bids. (*d*) provides for advance and progress payments to finance research. (*e*) permits the acquisition and disposal of property relating to research or resulting from it. (*f*) enables Foundation to receive and use any funds which may be donated to it by anyone for its general purposes. (*g*) provides that Foundation may publish or arrange for publication of scientific and technical information without necessarily using the Government Printing Office. (*h*) provides that Foundation may utilize services of voluntary and uncompensated personnel and permits payment of travel and subsistence expenses. (*i*) provides that, with the approval of the Comptroller General, Foundation may prescribe its own regulations with respect to controls over expenditures and administrative procedures of contractors and grantees.

SECTION 11. *Patent rights.* (*a*) provides that each contract executed pursuant to the act which relates to scientific research shall contain provisions governing the disposition of inventions produced thereunder in a manner calculated to protect the public interest and the equities of the contracting individual or organiza-

tion. No contract, however, can "alter or modify any provision of law affecting the issuance or use of patents."

SECTION 12. *International cooperation. (a)* authorizes cooperation in international scientific research. (SECTION 15 calls for consultation with the Secretary of State.) By *(b)* the Director, with the approval of the Foundation, is authorized to defray expenses of representatives of private as well as Government research organizations, and of individual scientists, in attending international congresses, etc.

SECTION 13. *Appropriations.* This section authorizes such appropriations as may be necessary for the Foundation; and any moneys so appropriated, if obligated in the year of appropriation, are to remain available for expenditure for 4 years.

SECTION 14. *General Provisions. (a)* authorizes Director to appoint and fix compensation of personnel. Technical and professional personnel may be employed without regard to civil-service laws and Classification Act of 1923. Deputy Director, members of divisional committees and advisory committees shall be appointed without regard to the civil-service laws. Director and Deputy Director are not to engage in other employment; and neither shall, except with the approval of Foundation, hold any office in, or act in any capacity for, any organization with which Foundation makes a contract. *(b)* authorizes Director to appoint Deputy Director, with the approval of the Foundation, at compensation not to exceed $12,000 per annum. *(c)* provides that the Foundation shall not itself operate any laboratories or pilot plants. *(d)* provides that members of the Foundation, of the divisional committees, or of special commissions, are to be compensated at the rate of $25 for each day when engaged in the business of the Foundation, plus travelling and subsistence expenses. *(e)* provides that persons holding office in the executive branch of the Government may serve in certain capacities under the act, but such persons are not to be compensated for such service. *(f)* provides that persons serving as members of the Foundation, the divisional or advisory committees, or special commissions, shall not be considered, by reason of such service, to be within the terms of certain criminal statutes dealing with contract settlements, except with respect to acts by them which relate to particular matters directly involving the Foundation or in which the Foundation is interested. *(g)* provides that in making contracts or arrangements for scientific research, the Foundation shall utilize appropriations available therefor in such manner as will (1) have work performed by organizations or individuals, including government agencies, qualified to achieve the results desired, (2) strengthen the research staffs of organizations, particularly nonprofit organizations, in the states and territories and the District of Columbia, (3) aid organizations which, if aided, will advance basic research, and (4) encourage independent research by individuals. *(h)* provides that the activities of the Foundation shall supplement, and not supersede, curtail, or limit the functions or activities of other Government agencies. *(i)* authorizes Government agencies having funds for scientific or technical research, or for the provision of facilities, to transfer such funds to the Foundation. *(k)* provides that the Foundation shall not support any research or development activity in the field of atomic energy, without obtaining concurrence of the Atomic Energy Commission. *(l)* provides that the Foundation, after consultation with the Secretary of Defense, shall establish regulations and procedures for the security classification of information or property (having military significance) in connection with scientific research under the act, and for the proper safeguarding of any information or property so classified.

COMMENTARY

Two factors must be borne in mind in commenting on the legislative situation as the 81st Congress convenes. First, Mr. Truman's re-election will probably strengthen the Administration's influence in modifying the S. 2385—H.R. 6007 bills, and securing passage. Second, the policy conflict over the legislation remains.

Basically, or at least simply stated, the conflict is this: Assuming that there will be substantial sums of tax-derived monies spent for science, should the authority for the formulation of a national science policy and distribution of funds be placed in a body responsible to the President, and through him to the Congress, *or* should the existing agencies of research be expanded by action of a body of part-time recognized leaders of science, education, and industry? Related issues are (1) public dedication of patentable results obtained on contract- or grant-research, *vs.* existing patent policies and practices; and (2) wide, quasi-geographical distribution of funds *vs.* monies to institutions where work can be done in the most efficient manner.

It should be said that the S. 2385—H.R. 6007 bills represent a compromise to bridge the original Kilgore-Magnuson cleavage. How well those settle the critical problems posed by the whole issue is debatable. The present bills place great power in the hands of a part-time Foundation composed of nongovernment employees; the patent issue is dodged; and the distribution formula is such that both efficiency-concentration and geographical distribution of funds are encouraged.

The S. 2385—H.R. 6007 bills place power and authority in the Foundation, made up of twenty-four nongovernment employees acting in a part-time capacity. This group can delegate as much or as little of its power and authority to the Director as the majority wishes. The Foundation members can allocate funds to institutions which employ them. (The House bill provides for an executive committee of nine elected by the Foundation, with the Director as a tenth member and the chairman, without vote. The Director is empowered to exercise all of the powers of the Foundation under general directives of the executive committee except the making of contracts, which would require executive committee action.)

Under each bill the Director would be appointed by the President, subject to the advice and consent of the Senate. The President is instructed to receive nominations from interested groups and from several specified groups. Both bills have corrected one feature of the act which was vetoed by the President: the power of appointment and removal of the Director is given to the President instead of to the Foundation. Both bills, however, continue to place in the executive branch of the government an agency, the Foundation, which is not responsible to the President.

Divisions and Commissions

Both bills set up four divisions of the Foundation: (1) medical research; (2) mathematical, physical, and engineering sciences; (3) biological sciences; and (4) scientific personnel and education. Five or more members (from within or without the Foundation board) of each are to be appointed by the Foundation (Senate bill) or the executive committee (House bill), to act in an advisory capacity. The Foundation may establish other divisions.

There may also be special commissions to survey public and private research in a given field and recommend programs. The House bill—but not the Senate bill—specifically provides for commissions on (1) cancer, (2) heart and cardiovascular diseases, and (3) poliomyelitis and other degenerative diseases. The Senate wording is preferable.

A division of national defense, provided for in S. 526 which the President vetoed, is not established in either 80th Congress bill, although the Foundation may, after consultation with the Secretary of National Defense, support scientific research in matters related to the national defense. The possibility of activity in this area, entirely reasonable in its purpose, raises questions about security classification of scientific research, referred to below.

Distribution of Funds and Patent Policy

The bill S. 2385 states that:

it shall be the objective of the Foundation to achieve the results of scientific research *in the most efficient manner possible* and to strengthen basic research and education in the sciences . . . throughout the United States . . . and *to avoid undue concentration* of such research and education (emphasis added).

H.R. 6007 states that:

it shall be one of the objectives of the Foundation to strengthen basic research and education in the sciences . . . throughout the United States, and to avoid undue concentration of such research and education.

The Senate bill wants to spread the federal funds throughout the United States, without adoption of a geographical formula, and yet produce results in the most efficient manner possible. The contradiction must be recognized.

The S. 2385—H.R. 6007 bills provide that each contract or grant by the Foundation

shall contain provisions governing the disposition of inventions produced thereunder in a manner calculated to protect the public interest and the equities of the individual or organization (contractor or grantee).

This wording was first suggested by Senator Smith as an amendment to S. 1850 in 1946, and was rejected prior to the bill's passage. Senators Kilgore, Magnuson, Pepper, and LaFollette were among those who spoke against it. S. 1850 as adopted provided for government ownership of patents resulting from federally financed research, with public dedication on a royalty-free, nonexclusive basis. The support for this position had been exceedingly wide at the hearings. S. 526, which Senator Smith introduced, and President Truman vetoed in 1947, contained the patent provision which was rejected in connection with S. 1850; this is the language in S. 2385—H.R. 6007.

In 1947 the Attorney General finished a four-year *Investigation of Government Patent Practices and Policies.* On the points in question the Final Report recommends:[2]

1. As a basic policy, all contracts for research and development work financed with Federal funds should contain a stipulation providing that the Government shall be entitled to all rights to inventions produced in the performance of the contract.

2. If the head of any Government agency certifies, with the approval of the Government Patents Administrator [a new office], that an emergency situation exists requiring that an exception be made to the basic policy in a particular case in respect of prospective inventions to which the contractor has made a substantial independent contribution prior to the award of the contract, such exception should, to the extent possible, be subject to the following conditions:

(a) The head of the agency concerned should certify, with the approval of the Government Patents Administrator, that he has made a reasonable effort to enter into a contract for the research or development work in question with a qualified organization in accordance with the Government's basic patent policy, but has been unsuccessful.

(b) The contract as awarded should stipulate that the contractor will be permitted to retain patent rights only to inventions which involve a substantial independent contribution by the contractor or his staff antedating the work called for in the contract, as determined by the head of the agency with the approval of the Government Patents Administrator, or, in appropriate cases, by arbitration.

(c) The contractor should grant the United States a nonexclusive, irrevocable, royalty-free license, to make, have made, use and dispose of any inventions awarded to him under the contract.

(d) The contractor (or his assignee) should agree to place the invention in adequate commercial use within a designated period; and if at the end of such time the Government determines that such use is not being made, the contractor (or his assignee) should be required to offer non-exclusive licenses at a reasonable royalty to all applicants.

3. Cooperative research projects shall also be subject to the basic patent policy, but the head of the agency concerned, with the approval of the Government Patents Administrator, may make an exception to this policy in a particular case when a proper showing of the need therefor has been made; provided, however, that the conditions of section 2 above shall be observed to the extent feasible.

4. To the extent permitted by law, grants of Federal funds for research or development work which may result in patentable inventions should be subject to the same patent policy as pertains to research and development contracts.

And further:

1. As a basic policy all Government-owned inventions should be made fully, freely and unconditionally available to the public without charge, by public dedication or by royalty-free, non-exclusive licensing.

It seems desirable that the National Science Foundation legislation should contain provisions to fulfil such recommendations.

Security Classification

Although the Foundation is not permitted to enter the field of atomic energy without the concurrence of the Atomic Energy Commission, the bills provide that the Foundation shall, after consultation with the Secretary of National Defense, establish regulations and procedures for the security classification of information or property having military significance. The possibility of the extension of security to new areas of basic science is a matter of great concern to scientists and university administrators charged with the task of education and research.

While classification of military research is necessary, provisions setting up the Foundation should not make possible the encroachment of secrecy over any area of basic science. The act could well provide that it shall not be the policy of the Foundation to support research on a continuing basis which requires classification; and that such research should be transferred to an agency designated by the Secretary of National Defense.

Social Sciences

The S. 2385—H.R. 6007 bills do not explicitly provide for social science; neither do they prohibit it. Sec. 4*(a)* (2) of S. 2385 directs the Foundation to "initiate and support basic scientific research in the mathematical, physical, medical, biological, engineering, and other sciences." Sec. 6 provides that, in addition to the named divisions, there may be "other divisions as the Foundation may, from time to time, deem necessary." Sec. 9 states that scholarships and graduate fellowships may be granted "in the mathematical, physical, medical, biological, engineering and other sciences."

2. U. S. Department of Justice, *Investigation of Government Patent Practices and Policies* (Report and Recommendations of the Attorney General to the President) (Washington: U. S. Government Printing Office, 1947), I, 5–6.

UNCERTAIN PROSPECT: NATIONAL SCIENCE FOUNDATION

Science Legislation Study Group
Washington Association of Scientists, FAS

The group whose views on the organization of science are expressed in this article has been active in promoting a strong Foundation, firmly integrated in the federal structure and responsible for formulating a comprehensive policy for science. It has published previous articles in the December, 1947, and January, 1948, issues of the **Bulletin.** Clifford Grobstein, chairman, John Conly, Laurence A. Heilprin, and Robert Stiehler form the committee which drafted the following statement.

As this is written it appears likely that a National Science Foundation will be established by the 81st Congress. What is uncertain, however, is the character of the Foundation and, in particular, whether or not it is likely to contribute to the primary need of the moment—the development of a comprehensive, integrative national science policy for the United States.

In view of the verdict of November 2, the Steelman Report and the President's speech before the AAAS at its Centenary meeting last fall[1] have acquired new significance. Taken together, these documents embody the incoming Administration's views on national science policy, and on the proposed National Science Foundation. The main recommendations, as summarized by the President in his address, were:

1. A doubling of "our total public and private allocations of funds." The scientific budget, he felt, should be fixed at approximately one per cent of the national income.
2. Greater emphasis on basic research and medical research.
3. Establishment of a National Science Foundation.
4. More aid to universities, both for scholarships and research facilities.
5. Better financing and coordination of research agencies of the federal government.

In addition, the President discussed the relationship of science to national defense, saying that "American scientists must like all the rest of our citizens, devote a part of their strength and skill to keeping the Nation strong." He decried, however, attacks upon the reputations of scientists "in the name of security," saying that they impede scientific research. "Scientists," he said, "do not want to work in ivory towers, but they do want to work in an atmosphere free from suspicion, personal insult, or politically motivated attacks."

He emphasized again the importance of basic research and the very special qualifications and conditions it requires. And he spoke strongly in support of the importance of the social sciences, hoping that they "will enable us to escape from those habits and thoughts which have resulted in so much strife and tragedy."

There is much comfort for scientists in these statements of the President of the United States. For the President has here approved the basic postulates of the scientist. He has clearly stated the critical importance of science in modern society and has urged its expansion. He recommends a National Science Foundation. He recognizes the key role of basic research as the foundation of all scientific knowledge. He is aware of the special conditions required for effective research and dedicates himself to safeguarding them. He speaks of the potential good for all of the people that lies not only in the physical and biological sciences, but particularly in the social sciences. Policies based on these assumptions certainly cannot be feared as detrimental to science.

Nevertheless, it must be pointed out that the stated objectives, admirable when taken severally, do not together constitute an effective national science policy. At the end of the recent war certain shortcomings in American science attracted wide comment. The United States had been strong in application but weak in discovery of new fundamental information; the time lag between discovery and application is often unnecessarily long; there is a serious shortage of adequately trained personnel; large areas of the country are undeveloped or underdeveloped scientifically; no federal agency exists concerning itself primarily with the problems of science.

These and other shortcomings the President's Scientific Research Board summed up by saying: "The United States has no unified or comprehensive policy on scientific research or the support of science." And, it may be emphasized, the United States has no agency specifically responsible for formulating such a comprehensive science policy. To many this appears to be the crux of the entire problem.

There is, at the moment, no overall shortage of funds to support research. The difficulty lies in the essentially uncoordinated distribution of the funds, in the failure to formulate specifically and find solutions to basic policy questions, in the complete absence of evaluation of the directions and progress of research—in short, in the completely unscientific manner in which the broad administration of science is conducted.

There are some who mistake such planlessness for virtue. They argue that scientific research must, by its very nature, be unplanned, that the effort to impose any type of coordination will stifle free research. The President's Scientific Research Board exposes the confusion in this argument when it notes that what is under discussion is not planning *of* research (which requires separate analysis), but planning *for* research.

National policy can, and should, decide what proportion of the federal research budget is to be spent in basic and applied research (insofar as these are clearly separable); whether military research, particularly when classified, should be conducted outside of military laboratories; what proportion of the budget should be devoted to developing new facilities and what proportion to exploiting the old; how basic and applied research can be brought closer together in order to reduce the lag between discovery and application; how the supply of new scientific personnel of high quality can be ensured.

Only through the development and implementation of broad policy on these and similar questions can the entire scientific structure, running the

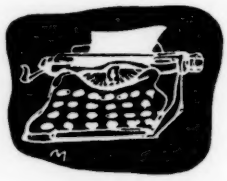
(Continued on Page 32)

1. *Science*, CVIII (1948), 313-14.

gamut from the most abstruse mathematical speculation to the practical problem of rust-resistant wheat strains, be kept vigorous and in balance. Science in the United States, with its proposed budget of two billion dollars annually, is a major function of our society. Like industry, agriculture, public health, communications, etc., it requires a federal agency whose primary concern is with its problems, which will constantly survey its effectiveness, and which will find ways and means, appropriate to our governmental structure, to further it.

No piecemeal approach will suffice. It must be recognised that modern science, in spite of its impact upon nearly every facet of our society, has a unity of its own. This is a fact which has been missed even by enthusiastic supporters of science. Science cannot, as suggested by the Steelman Report, be lumped under the general heading of educational problems—in spite of the long and treasured associations between science and education. Science relies upon educational institutions to disseminate the knowledge it gains and to train its personnel. But only a small, albeit significant, part of the nation's scientific research is carried on in educational institutions, and much of science is only remotely related to education.

There are some who regard science as part of the problem of military security. It is certainly a major buttress of military strength, but military research is far from being the exclusive concern or even the natural and preferred bent of scientists. Similar confusion has arisen with regard to the relation of science to technology and to medicine. In each case *one* of the functions of science is mistaken for its total social function.



Science *is* closely related to education, to military defense, to medicine, agriculture, and industrial technology, because it is virtually the sole source of new, objectively verifiable knowledge in each of these fields. But seen in totality, as it must be for purposes of national policy, modern science is that major social institution which has the peculiar responsibility for discovery of practically all objectively verifiable knowledge. It incorporates a large corps of skilled and specialized personnel, an accumulated body of time-tested knowledge and techniques, a peculiar set of attitudes and habits of thought, a commonly held technical language, a large and specially designed physical plant. And, in spite of the diffuse spread of its effects through the social fabric, the various areas of science remain functionally continuous, whether applied or fundamental, whether governmental, industrial, or academic. *The administrative organization of science must take into account this basic unity of its functional organization.*

The National Science Foundation, properly defined legislatively, could carry us far in the right direction. Unfortunately, the legislative history of the NSF shows a steady drift toward a weakening of its powers and narrowing of its scope. Originally seen as the central, coordinating, federal agency for top-level policy formulation and administrative integration of science (see S. 1285 and S. 1297 of 79th Congress), it became in S. 2385, of the last session of Congress, little more than another research foundation disbursing public rather than private funds. It is noteworthy, in light of the recent election, that this weakening of the Foundation conception in successive sessions of Congress directly reflected changing party composition and political philosophy. With few exceptions, liberal Democrats have favored a strong Foundation, conservative Republicans a weak one.

President Truman has consistently supported a Foundation firmly integrated into the federal governmental structure. He based his veto of the bill passed by the first session of the 80th Congress upon the weak administrative control it proposed. The President's attitude, coupled with the altered complexion of the 81st Congress, has produced a decidedly more favorable climate for establishing the kind of Foundation most scientists have indicated they want.

It is puzzling that, in spite of this altered situation, influential individuals, including some scientists, are urging that S. 2385—the weak Foundation version of the last session of Congress—be accepted as the basis for a renewed effort in the coming session. They argue not that S. 2385 is a good bill—few regard it as that—but that it is one on which wide agreement was reached and therefore will be easiest to get approved. But agreement reached after a long struggle may signify not wisdom but weariness. Many who withheld their criticism of S. 2385 last spring did so because they felt that this bill—with all its tortured compromises—was, if not the best bill, at least the best obtainable under the existing circumstances.

There is reason to believe that the weak Foundation proposed by the Steelman Report may have been the result of this weariness. Faced by a strongly controlled, hostile Congress, the President's Scientific Advisory Board recommended a Foundation which, instead of forming the capstone of the nation's administrative structure for science, was limited nearly exclusively to the making of grants and the awarding of scholarships and fellowships. *This is an important, but not the essential, role of the Foundation.*

If we are to have a sound national science policy, we must first have a strong agency responsible for recommending such policy to Congress, and capable of implementing it, once established. The National Science Foundation must be organized as the federal agency primarily concerned with the evaluation, planning, and support of the national science effort.

As such, it must be staffed by full-time, properly trained and qualified governmental personnel in whose hands, as executive officers, lie complete administrative responsibility and authority. It should have broadly representative advisory boards of scientists and citizens. These boards should be organized so as to give the Foundation effective liaison with education, public health, industry, defense, agriculture, and other activities (or agencies) having direct interest in science.

The Foundation should also have close liaison with all federal agencies disbursing research funds to nonfederal organizations, and should make recommendations for their coordination. It should assist in coordinating the research conducted within the federal government itself, having as one of its advisory boards the recently established Interdepartmental Science Committee. Its relationships with the Atomic Energy Commission and the Research and Development Board of the Department of National Defense should be carefully defined so as to indicate that the broader responsibilities of the Foundation must not be sacrificed to the narrower, but immediately more insistent, requirements of these older agencies. In the field of fundamental research the pre-eminent responsibility of the Foundation must be recognized.

(Continued on Page 32)

SCIENTISTS' RESPONSIBILITIES ON THE WAY TO PEACE, AND AFTER

Cuthbert Daniel and Arthur M. Squires

In the October issue of the **Bulletin,** Drs. Daniel and Squires contributed an article entitled "Freedom Demands Responsibility," in which they discussed whether scientists and engineers should refuse to participate in weapon research and development. This was made the subject of a symposium in which prominent natural and social scientists took part. In this article the original contributors reply to their critics. Dr. Daniel is a consulting statistical engineer; Dr. Squires, a physical chemist. Both were formerly employed on the gaseous diffusion project at Oak Ridge.

In writing our piece "Freedom Demands Responsibility" (October *Bulletin of the Atomic Scientists)*, we supposed it possible to discuss the question of scientists' responsibilities, today as well as in a hypothetical better world, apart from a statement of our views on the international deadlock and on the nature of its solution. We were mistaken. Messrs. Ashby, Lerner, and Urey, who replied in the October and November *Bulletin*, quite naturally assumed that we had intended to make such a statement, and were led by what we wrote to castigate a point of view on the larger matters of war and peace which we did not express. (They even assume we propose to insure peace by a scientists' strike!)

Accordingly, our reply is in two parts: In "A Step Toward Peace" (scheduled to appear in the January issue of *Politics*), we present our notions on the larger matters, and here we try to put our notions on scientists' responsibility in better perspective.

Like Lerner and Urey, we believe that only a world government can make men reasonably secure from war. We believe that the atomic bomb makes world government inevitable in our time. It is a simplification of history, but not an over-simplification, to say that gunpowder forced men to organize the nation-states of the eighteenth and nineteenth centuries. The downfall of feudal dukedoms took place during several bloody centuries. We want the downfall of nation-states, so likely to occur in a few bloody decades, to be peaceful. We want the world government which results to be a democratic one.

Lerner and Urey say nothing of the status of science under a democratic world government. Do they hold that under world government there will be freedom for the development of atomic super-bombs?

We are not concerned with our souls or with absolute distinctions between good and evil. We are concerned with the way in which a host of decisions controlling day-to-day and year-to-year development of science and technology are made.

The development of science is not foreordained to follow some particular line. No billion-dollar weapon project is inevitable. Lerner speaks of "the possible new weapons that science may discover." This manner of speaking conceals two important facts: *Men*, not *science*, govern the lines along which science evolves. Complicated modern weapons are not *discovered;* these things are *developed.*

Lerner asks, "What power or knowledge is there which cannot be turned into weapons?" Professor von Laue fears the attempt to prohibit "the research which a well-informed and inventive mind one day may turn to warlike use." We think there are no examples of knowledge which can be turned into modern weapons by a single mind, i.e., without the organized, concentrated effort of many men. As we noted earlier, a heavy investment lay between the discovery of fission and the production of radioisotopes on the one hand, and the production of atomic bombs on the other.

Lerner incorrectly implies that radioisotopes could not be enjoyed today if the bomb had not been produced. The Clinton pile has produced nearly all radioisotopes used in research at present. It cost considerably less than ten million dollars; and the research which went into it was substantially complete by late 1942, when the decision to go ahead with bomb development and production was made.

The atomic bomb was not "discovered." Its development was not inevitable. A small group of men debated the question of its development and decided to invest a specified number of billions of dollars to complete it within a specified length of time. Such a decision is not inevitable. Many another development which is technically feasible has so far gone by default because men—generally, again, a small group of men—decide on some grounds or other that the *worth* of the development does not justify the money and talent which it would require.

The criteria on the basis of which technical developments are judged are generally two: "Will it make money?" "Will it kill and destroy more efficiently?" If the world is to have peace, men must learn to decide against the development of atomic bombs on the grounds that these things are far more likely to be put to evil use than to good use. Here is no search for certainty, as Lerner accuses, but an attempt to weigh the probabilities and to make more responsible choices.

The freedom of science, like the freedom of commercial enterprise, should not be absolute. Nearly absolute freedom can be afforded an individual scientist working independently on problems of his own choosing, as it can and should be afforded the small enterpriser. But just as a distinction should be drawn between John D. Rockefeller and the small enterpriser whom Adam Smith described, so should there be a distinction between the science-factory (to borrow Professor Wiener's term) and men like Faraday, Priestley, Pasteur, and Cavendish.

Big projects should be launched only after full discussion. The discussion should be initiated by the men who conceive the project; the entire scientific community should take active part. The discussion should not be postponed until after a development is quietly made, when often the only question is how men can accommodate their lives and institutions to the new gadget which science has "discovered."

Under a world government there must be no super-bombs. One of its

functions will be the policing of the world to see that none are made secretly; the world government itself should not make any. Put thus negatively, many scientists will view this function of world government with distaste. But the world government has another function of much greater importance, on which its long-term success will heavily depend. It must so arrange things that the policing function is a very small one. The inducements to groups of scientists and engineers to work on a super-bomb project—opportunities for research, status, power—must be outweighed by greater inducements to work elsewhere, on pure science or on constructive projects. The policing function will always remain, but we may hope that the initial period during which its importance is great will be short.

Our examples of issues requiring "local democracy," to which Lerner objects, were unfortunate perhaps. A super-bomb has a grandeur not shared by shrimps. Nevertheless there is a parallel. Few people besides the twenty-odd canners and fourteen-hundred-odd fishing-boat captains of Biloxi will concern themselves with the declining yield of shrimp from Mississippi Sound. Studies leading toward scientific conservation of shrimp will not be inaugurated by miners or farmers. An agency responsible for enforcement of regulations governing shrimp fishing will be helped enormously by a sense of responsibility among fishermen—by moral pressure on the few individuals who fish out of season.

A world government's task will be easier—the policing function, less important—if the community of scientists have a responsible attitude toward atomic super-bombs. If scientists shrug their shoulders and say, "Let science proceed as it [i.e., men] will," miners and farmers are not likely to discuss the super-bomb (or even hear of it) until after it has happened. The more responsible the scientific community, the less will be the need of legislation and law enforcement.

Fortunately for shrimp conservation, fishing out of season has a direct, tangible ill effect on the interests of fishermen in general; and the poacher does not automatically enjoy an access of status and power. The prohibition of super-bombs acts against the short-term interests of a few scientists. As we noted earlier, particular courage and freedom of intellect is demanded of scientists if they are to make clear their disapproval of the power-minded scientist who flourishes in the twentieth century.

We do not, as Ashby states, ascribe to scientists "*special* influence and *special* responsibilities" (our italics). They simply have responsibility for matters which they can foresee—and so do Lerner's teacher of algebra, his concrete manufacturer, etc. Responsibility resides in individuals and in small, cohesive groups of individuals—not in nations or in an entity termed "society."

So much for scientists' responsibilities under a democratic world government. Much more could be said along lines indicated by Ritchie, but our concern here is with immediate threats.

We contend that all the foregoing statements have application in some degree under the present world situation. Scientists are not called on today to help enforce regulations against illegal developments, but the way to peace will be clearer if scientists recognize explicitly which of their present activities must stop if peace is to be secure.

Our earlier article did *not* propose a scientists' strike, as Messrs. Ashby, Lerner, and Urey assumed. A strike must have aims; a strike is unthinkable until scientists can unite on a set of aims. As Ashby points out, scientists today lack "solidarity of conscience," the prerequisite to concerted action. This can be achieved only by discussion, to which this symposium is a contribution. If concerted action becomes possible, we will be forced to oppose it if its aims are ones which most of the world's people would deem unworthy—ones which could be claimed by Communist agents. If worthy aims can be agreed upon, there will be time to discuss the next step.

But how little discussion goes on today. For one word opposing rocket development, *or frankly defending it for what it is,* we see thousands, at best, written in open-mouth wonder at its Buck Rogers aspects, at worst, prating of rockets' usefulness for commercial transportation, and, at the furthest remove from relevance, praising rockets as tools for outer-atmospheric research. We see little serious writing which considers the effects of rockets on warfare. We see little writing which defends rocket development as an evil which must be carried on concurrently with strenuous efforts to make it unnecessary forever. Such an argument we could respect—and reply to; we can no longer respect Buck Rogers, Rocket Transit, Inc., and the rest.

The clearest example is the atomic super-bomb. In our opinion, no aspect of the present world situation, nor of any conceivable situation, warrants the development of this horror. It is not a weapon of war but of race suicide. It cannot be used as an instrument of policy. Its first owner will feel forced to use it before his few years of monopoly run out, and they will be few, since no security system can altogether prevent leaks of essential ideas concerning its construction.

It is a most serious indictment of American democracy—and of our attitude toward our freedom—that a decision to put hundreds of millions of dollars into the development of the super-bomb can be made in secret by a handful of men. No considerations of national security (Russia is sure to learn of it anyway) can override the need for full discussion of this decision by the American people. Rather, security demands discussion. There may be good reasons for developing the super-bomb, but we have not heard of them, nor apparently will we hear of them. We give our reasons against it here and hope that the discussion starts.

We are not pacifists, just yet. If we are asked, "Do you believe war is the greatest possible evil?" just now we must say no. But we cannot be sure of our reply a few years from now, if in the meantime atomic super-bombs and super-rockets have been made.

How little discussion goes on. The Federation of American Scientists studiously ignores the world government movement; it neither criticizes the movement nor helps it. The Federation's main activity now is in the field of civil liberties: the recent abuses of scientists' liberties are abominable, and one must fight against them; but they are symptoms of deeper troubles—symptoms which may be temporarily alleviated but cannot be cured apart from the disease.

Messrs. Lerner and Urey point out that the arms race is also a symptom of deeper troubles. But here the medical analogy does not completely hold. We do not imagine that permanent peace can be secured by disarmament alone. But the arms race is a symptom

(Continued on Page 32)

UNITED NATIONS ATOMIC ENERGY NEWS

Peter Kihss

Mr. Kihss, a member of the staff of the New York Herald Tribune, who has regularly reviewed the UN Atomic Energy negotiations at Lake Success, here surveys the debates on atomic energy held in the United Nations General Assembly at Paris, between October 7 and the close of the session.

Assembly debates on atomic energy through October 7, when several suggested resolutions[1] were transferred to a subcommittee of the political committee, have been previously summarized by the *Bulletin*.

October 8 — In the subcommittee, Mr. Osborn said that "while the first report followed the Baruch proposals, the recommendation in the second report that all atomic plants capable of producing on a dangerous scale should cease operating until effective control was established, and the provision that quotas should be provided for in the convention, both constituted drastic changes in the American proposals."

Yakov A. Malik, of the Soviet Union, asserted that "the majority plan was American and even outdid the original Baruch proposal in its infringements upon national sovereignty, a conclusion shared by others such as South Africa." General McNaughton contended, however, that "there was nothing inconsistent with the majority proposals in the precaution taken by the Union of South Africa of ensuring that ownership of ores containing fissionable materials was at all times vested in the state."

October 9 — The subcommittee rejected a Soviet proposal to avoid any verdict on the UNAEC reports and, by nine votes to two, approved a section of a Canadian resolution to endorse them as "constituting the necessary basis" for atomic control.

October 11—Sir Benegal Rau, of India, argued that Russia's latest proposal for simultaneous conventions on control and prohibition of atomic weapons, combined with its plea to avoid judging the UNAEC work, were new developments warranting resumption of Commission effort.

Mr. Osborn replied that "the majority was of opinion that, if control were not introduced in stages and if raw materials were not controlled, the result would be that in countries where public opinion was free there would be effective prohibition and control, while no such effective control would exist in countries behind the Iron Curtain. He again supported the adjournment of the UNAEC, saying that "the experience of the Commission had shown that if the work were continued, the areas of disagreement might be widened rather than reduced."

October 12—Eight members of the subcommittee endorsed the complete Canadian resolution,[2] while the Soviet Union and the Ukraine backed the Russian simultaneous-convention proposal, and India alone favored a resolution to approve the majority plan "in substance" only. Mr. Malik asserted that the Soviet Union was "making a concession by no longer insisting on the priority of prohibition," and had proposed avoiding an appraisal of past work "in a spirit of conciliation."

October 18—The political committee took up the subcommittee report, and Mr. Austin said that the Russian proposal for simultaneous control and prohibition of atomic weapons (as opposed to the introduction of controls in stages, terminating in abolition of atomic bombs) "would eliminate atomic weapons and explosives in one country, months, or perhaps years, before the system of control and inspection had been able to locate and determine the existence of atomic weapons and explosives in certain other countries." Mr. Austin saw no present point in defining stages when agreement on other issues appeared so remote, or in discussing the staffing of a control organ now (these being among the subjects proposed for discussion in renewed meetings of the UNAEC).

Mr. Malik asserted that the "stages" argument meant that the United Kingdom and the United States wished to bring mineral deposits immediately under control—"meanwhile the means of production of atomic energy in the United States would not be subjected to control."

Sir Alexander Cadogan, of Great Britain, felt that, if the Commission renewed work despite Russian opposition, matters would only be embittered.

Hector David Castro, of El Salvador, said that his country could not give blanket approval to the majority plan, since its mining laws would not allow international ownership of minerals. But he said that the ownership question was "not of primary importance; the basic question was that of control over production and use of atomic energy."

Faris El Khouri, of Syria, argued that continued Atomic Energy Commission meetings would keep the situation under daily public scrutiny, whereas, if the issue were left only to six-power consultation, work might be suspended and no one would know what was going on. India, Australia and El Salvador also objected to suspending the Commission.

W. G. Parminter, of South Africa, said that his country would be seriously affected by the recommendation in the majority plan for international ownership of atomic ores, since some such ores were mixed with gold, on which its economy was heavily dependent.

October 19—Canada and the United States accepted the smaller-power view that the Commission ought to reconvene for such work as was possible, although they were skeptical of the possibilities of accomplishment.

October 20—The Canadian resolution, revised to provide for the reconvening of the UNAEC, was approved, forty-one to six, with ten abstentions. In favor were Australia, Belgium, Bolivia, Brazil, Burma, Canada, Chile, China, Colombia, Costa Rica, Cuba, Denmark, Dominican Republic, Egypt, Ethiopia, France,

1. *Bulletin*, IV (November, 1948), 332.
2. Ibid., 332-33.

Greece, Haiti, Honduras, Iceland, Iran, Iraq, Lebanon, Liberia, Luxembourg, Mexico, Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Siam, Sweden, Turkey, United Kingdom, United States, Uruguay.

Against were Byelorussia, Czechoslovakia, Poland, Ukraine, U.S.S.R., and Yugoslavia. The ten abstentions included Afghanistan, Argentina, Ecuador, El Salvador, India, Saudi Arabia, Syria, South Africa, Venezuela and Yemen. Of these ten, Argentina and Syria, as Commission members, have heretofore endorsed the majority plan; Ecuador voted for the resolution paragraphs endorsing it; El Salvador, in debate, had approved it in principle; and India had sponsored a resolution to endorse it in substance.

November 3—The atomic question went back to the full Assembly. There Mr. Austin held that the recommended six-power consultations "should be at a high level and be principally concerned with the reason why the U.S.S.R. finds itself at present unwilling or unable to take a cooperative part with other nations in the necessary measures for the maintenance of peace." The Assembly, he said, was taking a "critical step" in the atomic problem, and should express a mandate in "clear and unequivocal terms," so as to wield "the moral power of its own carefully considered judgment" and "provide a new lever by which new forces of cooperation could be activated."

November 4—The windup of atomic debate saw heavy Russian emphasis on Professor Blackett's book. Czechoslovak Foreign Minister Vladimir Clementis said that "no doubt it was a marked overestimate of the importance of the atomic bomb for the purposes of military strategy which largely caused the initial false approach" in the search for atomic control.

Andrei Y. Vishinsky asserted that the resolution adopted by the political committee would "put a tombstone on the work of the Atomic Energy Commission." The suggested UNAEC work program, he said, showed that "the subjects remaining are actually questions of secondary importance, while the questions which have already been settled are the important questions."

Mr. Vishinsky said that one of the most important problems was "the lack of a system ensuring appropriate distribution of quotas among countries—quotas of atomic fuel and distribution of raw materials." This question, he said, "has not yet been studied sufficiently in the Commission. However, such a proposal might facilitate the reaching of agreement on a great number of other questions, and would be sufficient, according to specialists, to remove the problem of ownership by the international control organ."

Mr. Vishinsky cited Professor Blackett with approval as having held that the international agency contemplated in the majority plan might hamper Russian development of atomic energy for peaceful uses, and "impose upon the U.S.S.R. the necessity of indicating to the control organ the situation of its industries, and of giving to the inspectors of the U.N.—and therefore to the United States staff commanders — a complete map of military objectives within the U.S.S.R."

The stages proposal, Mr. Vishinsky asserted, "would mean control with respect to those stages of production where control was desired by the majority, and it might mean the elimination of control over all future stages."

Mrs. Vijaya Lakshmi Pandit, of India, said that her country lacked oil, and so "the importance of atomic energy as a source of power is all the greater for us...While India would agree in principle to the international control of *all* power-producing materials, we cannot agree to international ownership and distribution of only those materials capable of generating atomic energy while other materials, such as oil, remain without any international control."

Mrs. Pandit said that India was prepared to exchange its thorium for such materials as oil. She favored the majority recommendations for control of nuclear fuel production plants and for free and full inspection, and thought that these would suffice without requiring "the control or international ownership of the raw materials themselves."

Defense Minister Paul Ramadier, of France, said that he had been "struck just now by the importance which was given in the speech of the delegate of the U.S.S.R. to the problem of quotas," and felt that this might be "an important new element." He thought that the Soviet Union might bring "proposals in this connection," on which the Commission could work.

Juliusz Katz-Suchy, of Poland, returned to the stages issue, asserting that the Baruch Plan's first step would be control of mines and raw materials. "According to a rough estimate," he said, "the photographic survey which the completion of this stage would necessitate would require approximately two years, not to mention other parts of the first stage. From the beginning to the completion of the United States plan, until the attainment of the prohibition stage, at least thirty years would have to be spent on various stages."

Colonel W. R. Hodgson, of Australia, observed: "A year ago, there were twelve national research institutes in existence. Today there are over twenty, and the longer the delay in establishing international control and inspection, the more difficult it will be to control all the work of the various national governments in this field."

The Russian simultaneous-convention resolution was then voted down, forty to six, with five abstentions. The Indian resolution to approve the majority proposals only "in substance" lost by nine votes in favor, fifteen against. The resolution of the political committee was then adopted by forty votes to six, with four abstentions.[3]

Meanwhile, delegates had also been working on a Russian proposal for a one-third cut in Big Five armaments and armed forces, coupled with prohibition of atomic weapons and establishment of controls within the framework of the Security Council. On October 12, Mr. Austin told the political committee that "the objective in steering this proposal into the Security Council, with the veto as the trapdoor, is too obvious to permit serious consideration." Mr. Vishinsky declared that armaments reports, under the Russian proposal, should include atomic and other weapons of mass destruction.

A disarmament subcommittee was set up on October 13. In that group, on October 16, Dr. Katz-Suchy, of Poland, complained that the atomic debates had failed to decide the date of destruction of atomic weapons. "When the convention on the prohibition of poison gas and dumdum bullets was adopted, no one had asked that a control system should be established first," he remarked. "When do we start destroying atomic bombs—in 1970 or 1995?"

Senator Henri Rolin, of Belgium, noted that the atomic issue differed from that of gas: "That convention did not relate to production, and the

3. The resolution is identical with the Canadian draft printed in the *Bulletin* IV (November 1948), 332-33, except that it provides for the UNAEC to resume its deliberations instead of adjourning it indefinitely.

belligerents had pursued the fabrication of gas shells during the World War without restraint, although they had not made use of them."

On the veto problem, Mr. Malik, on October 21, recalled that the Russian Foreign Minister, V. M. Molotov, in the 1946 General Assembly, "said that the principle of unanimity would be required for the decision of the Security Council which created the organs entrusted with the operation of control systems. However, once the organs were created and had begun to function, they would work in accordance with rules laid down for them. It was to be clearly understood that the principle of unanimity in the Security Council had no relation to the work of the control organs. Consequently, it was wrong to imagine that the veto could hinder the implementation of systems of control and inspection."

The subcommittee rejected the Russian proposal October 25, six to two, and approved a Belgian-French proposal, seven to two, to call on the Conventional Armaments Commission to work out a plan for reports and checkups. In political committee, the Russian proposal was again defeated, thirty-five to six, with seven abstentions, on November 13, while the committee resolution, with amendments, was approved, forty to six, with one abstention.

The Assembly itself next took up the problem. Senator Rolin stressed that "the first step that we are asking you to take is a larger step than the one which was proposed as a basis by the preparatory committee of the Conference on Disarmament, which concluded that the members of the League of Nations should give information about their armaments without the establishment of control." The committee resolution was adopted by a show of hands, forty-three to six, with one abstention. The Russian proposal lost, thirty-nine to six, with six abstentions.

The resolution adopted read:

THE GENERAL ASSEMBLY

DESIRING to establish relations of confident collaboration between the states within the framework of the Charter and to make possible a general reduction of armaments in order that humanity may in future be spared the horrors of war and that the peoples may not be overwhelmed by the continually increasing burden of military expenditure;

CONSIDERING that no agreement is attainable on any proposal for the reduction of conventional armaments and armed forces so long as each state lacks exact and authenticated information concerning the conventional armaments and armed forces of other states, so long as no convention has been concluded regarding the types of military forces to which such reduction would apply, and so long as no organ of control has been established;

CONSIDERING that the aim of the reduction of conventional armaments and armed forces can only be attained in an atmosphere of real and lasting improvement in international relations, which implies in particular the application of control of atomic energy involving the prohibition of the atomic weapon;

BUT NOTING on the other hand that this renewal of confidence would be greatly encouraged if states were placed in possession of precise and verified data as to the level of their respective conventional armaments and armed forces;

RECOMMENDS the Security Council to pursue the study of the regulation and reduction of conventional armaments and armed forces through the agency of the Commission for Conventional Armaments in order to obtain concrete results as soon as possible;

TRUSTS that the Commission for Conventional Armaments, in carrying out its plan of work, will devote its first attention to formulating proposals for the receipt, checking and publication, by an international organ of control within the framework of the Security Council, of full information to be supplied by member states with regard to their effectives and their conventional armaments;

INVITES the Security Council to report to it no later than its next regular session on the effect given to the present recommendation with a view to enabling it to continue its activity with regard to the regulation of armaments in accordance with the purposes and principles defined by the Charter;

INVITES all nations in the Commission for Conventional Armaments to cooperate to the utmost of their power in the attainment of the abovementioned objectives.

The United Nations Atomic Energy Commission thus opens its 1949 year at Lake Success with a General Assembly mandate, put through by worried smaller nations in Paris, to resume work on such topics "as it considers to be practicable and useful." With this goes a forty-to-six Assembly endorsement of the Commission's majority proposals for controls by international operation of dangerous atomic activities.

Returning Western delegates, led by General Andrew G. L. McNaughton, of Canada, and Frederick H. Osborn, of the United States, held that the Assembly had consolidated non-Russian nations more thoroughly than ever.

All this had "badly shaken" the Russian position, General McNaughton argued on his arrival back in New York on December 11. "It has begun to make the Russians feel pretty isolated in the matter. It won't create an immediate reaction. It will take time for this to sink through, but then I feel confident they will stop and review their course."

General McNaughton believed that the first task of the 1949 Commission would be to familiarize three new delegations—Egypt, a 1946 member; Cuba, and Norway — with the past work. By U.N. rotation, these three succeed Syria, Colombia, and Belgium. Paris experience, he said, also showed that the majority views—notably the second report—should be simplified in language, although "not changing any of the conclusions reached."

Thereafter, he said, the Commission should examine its work program, and also "make the political matters stand out in sharper relief" to prepare for consultations among the five great powers and Canada on possibilities of agreement, another course specifically recommended by the Assembly. If differences remain as at present, General McNaughton believed such talks might take place about June "on the Foreign Minister level."

Among issues hammered on by the Soviet group in Paris was the thesis that the majority plan aimed at initial U.N.—and so, it was argued, American—control over raw materials, while all other stages would be postponed indefinitely. Majority delegates then stressed that the stages question had never been discussed in detail in the Commission.

On Mr. Osborn's return he was asked whether he had noted any European favor for the idea of a moratorium on large-scale atomic power development, being urged here by some atomic scientists. Mr. Osborn said: "If the Europeans felt we were supporting a plan to prevent rapid development of atomic power, they would attribute sinister motives to us. They would say that the United States has all the power it needs, coal and everything else, and is trying to hold the rest of the world back."

Mr. Osborn expressed surprise that British scientists had not grasped the changes in the plan made in the second report—notably, the proposal that production quotas be set by treaty and that nuclear fuel production be held down to the amount needed for actual beneficial uses.

Pitzer New Director AEC Research Division

The U. S. Atomic Energy Commission announced the appointment of Dr. Kenneth S. Pitzer as Director of the AEC's Division of Research effective January 1. Dr. Pitzer, whose special field is physical chemistry, is taking a leave of absence from the University of California Department of Chemistry, where he has served since 1937. He will direct the Commission's research program in the physical sciences, and will supervise the isotope production and distribution program. He succeeds Dr. James B. Fisk who resigned in August to take up his duties as Professor of Applied Physics at Harvard University.

Uncertain Prospect

(Continued from Page 26)

Obvious practical difficulties face such a new Foundation. Jurisdictional disputes are inevitable in view of the long delay in its establishment and the consequent rise of originally temporary substitutes to fill portions of the obvious need. It is only natural that these substitutes, such as the excellently conceived programs of the Office of Naval Research and the National Institutes of Health, have now acquired permanence and would be only reluctantly discontinued—in the unlikely event that this be unwisely recommended. But in the face of national need, jurisdictional disputes are not settled by postponement and equivocation, as the present conflicts within the National Defense Establishment serve warning.

We need a national science policy as an integrative influence in the national science effort. We can get that policy only from a soundly conceived Foundation with sufficient, clearly defined authority. S. 2385 of the last session does not provide such a Foundation. It is to be hoped that the Truman Administration, now more fortunately endowed with congressional influence and public prestige, will recreate the necessary conception of the National Science Foundation and thus set us on the road toward a true national science policy with the material and intellectual benefits a vigorous expanding science can bring.

Science Foundation

(Continued from Page 2)

invading the President's prerogatives to such a degree that the bill demanded—and received—a veto. Fundamentally, however, scientists themselves must assume the burden of blame for four years' delay in the passage of an act providing support for basic scientific research. Neither as individual citizens nor as members of scientific organizations have they made their views known to their congressmen. They have permitted a minority group to draft partisan legislation and to block disinterested legislation, without so much as raising a protest.

Now, as the 81st Congress evolves its legislative program, we must decide whether we are satisfied with the present situation, in which industrial, military, and nonmilitary governmental research programs are reasonably well supported, while the independent researcher finds meager support in many fields and none at all in some. If we are satisfied, we need simply remain inert to assure the defeat of new legislation. If, on the other hand, we want to broaden the base and strengthen the monetary props for research that is independent of industrial, military, and bureaucratic directives, we must get busy. Representatives and Senators respond to pressure, not to indifference.

We must make sure that the scientific organizations to which we belong do not fit Will Rogers' definition of a commission, as "a group of important people who, individually, can do nothing but who, collectively, can decide that nothing can be done." We can be more powerful than we know, and we might try throwing our weight around—just once, in the interest of a well-conceived National Science Foundation that will bring even greater benefits to the nation than it will to individual scientists.

Commissioner Waymack Resigns

The first change in the composition of the Atomic Energy Commission since its formation in 1946 occurred on December 15 when W. W. Waymack resigned for compelling personal reasons. In accepting the resignation, President Truman praised Mr. Waymack's public service as exceedingly valuable to the national interest. Mr. Waymack was editor of the Des Moines Register and Tribune prior to his AEC appointment.

Scientists' Responsibilities

(Continued from Page 28)

which we can attack and lop off, and the lopping off will react on the core of the social body quite differently from the way palliation of a disease's symptoms may react on a man's body. To see this, the reader need only consider the effects of stopping the present world annual outlay of several tens of billions on weapons and of putting this money to constructive use.

As Ashby points out, war was evil before the atomic bomb and the airplane. Our problem is an old one. But in the twentieth century, as Professor von Laue observes, "the ethical level of our civilization has . . . declined to an alarming degree." Mechanization of war has brought new capacities to do evil. That knives and clubs may kill (as well as perform useful tasks) is not argument against making it harder for men to do evil by getting rid of atomic bombs and the rest. The modern weapons greatly increase man's ability to hurt other men at long range. Not many men enjoy beating other men with sticks; at least they do not indulge habitually in this form of pleasure. But it is alarmingly easy for nearly all men to condone the development of atomic superbombs "for defense" and to endorse their use against unseen people thousands of miles away, who are really innocent and not responsible because they live under a tyranny which prohibits their doing anything about the world situation.

We Americans live in a democracy; we are responsible; and if the vicious circle leading to war is to be broken, only we can do it.

French Atomic Pile

Professor Joliot-Curie, head of the French Atomic Energy Commission, announced on December 15 that France's first chain-reacting uranium pile had gone into operation at Fort de Chatillon, in the suburbs of Paris. The Chatillon pile utilizes heavy water instead of graphite as a moderator, and uranium oxide instead of metallic uranium as fissionable material. It is a "zero-energy" pile, producing no significant amount of plutonium.